



# LIJEČNIČKI VJESNIK

GLASILO HRVATSKOGA LIJEČNIČKOG ZBORA

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# LIJEČNIČKI VJESNIK

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## PREFACE

The scientific conference during Croatia's Presidency of the Council of the European Union entitled *Better Future of Healthy Ageing 2020 (BFHA 2020)* is organized by the University of Zagreb School of Medicine in cooperation with the Ministry of Science and Education of the Republic of Croatia, under the auspices of the European Commission and the Government of the Republic of Croatia as part of the Croatian Presidency of the Council of the European Union. The organization of the conference is funded within the European Union's Horizon 2020 Research and Innovation programme.

The Conference is organized with the contribution of all Croatian medical schools including University of Rijeka Faculty of Medicine, University of Split School of Medicine and Josip Juraj Strossmayer University of Osijek Faculty of Medicine, as well as other faculties of the University of Zagreb – the Faculty of Electrical Engineering and Computing, Faculty of Economics and Business and Faculty of Croatian Studies.

Organizational support is provided by the Ministry of Health, Ministry for Demography, Family, Youth and Social Policy and the Ministry of Foreign and European Affairs of the Republic of Croatia.

The overall mission of the Conference is to stimulate research, implementation and scaling up innovations to manage health and wellbeing of the ageing population. BFHA 2020 is a scientific conference that enables a discussion on the transformation of health and care services into more digitalized, long-term, integrated and personalized care models while promoting innovative ecosystems to deliver a better quality of life among the elderly. In line with this mission, the Conference addresses growing demand caused by the global trends of population ageing and the expansion of chronic diseases by focusing on potentials large-scale implementation of innovations to foster functional ability and wellbeing of older people.

The objectives of the Conference are as follows:

- to address issues of *ageing of biological systems* through the topics of regenerative medicine, neuroscience, clinical medicine and other fields of medicine with the emphasis on personalized and integrated medicine;
- to showcase the *impact of smart technologies for age-friendly ecosystems* by providing a discussion on scaling-up innovations and solutions for age-friendly environments;
- to analyse the issues of *ageing and healthcare system sustainability* at various levels (e.g. institutional, regional, state, EU level).

The Conference addresses the main topic across the three objectives through different dialogue and exchange formats including keynotes, plenary discussions panels, thematic sessions, and poster presentations. The final Conference outcome is the Policy Paper aimed at stakeholders, policymakers, the scientific community, and healthcare providers.

The Croatian EU Council Presidency Conference on Better Future of Healthy Ageing 2020 (BFHA 2020) has been planned to take place from April 6<sup>th</sup> to 7<sup>th</sup>, 2020 at Andrija Štampar School of Public Health, School of Medicine, University of Zagreb. Unfortunately, that was not

possible due to the ongoing COVID-19 pandemic situation, as well as due to the earthquake that hit Zagreb in March 2020. So, the BFHA2020 conference has been organized online from June 3<sup>rd</sup> to 5<sup>th</sup>, 2020.

The COVID-19 pandemic is impacting the global population in drastic ways. In many countries, older people are facing the most threats and challenges at this time. Although all age groups are at risk of contracting COVID-19, older people face a significant risk of developing severe illness if they contract the disease due to physiological changes that come with ageing and potential underlying health conditions. The pandemic outlines the importance of disease prevention using hygiene measures, well known long-ago. Our legacy in disease prevention and health promotion came from one of the most important physicians all over the world, Doctor Andrija Štampar, globally known as one of the founders of the WHO and his definition of health *as a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity* is still a part of the WHO Constitution. In light of his words, we can conclude that every person on Earth should have the opportunity to live a long and healthy life. We hope that this E-conference Better Future of Healthy Ageing 2020 would contribute to the improvement of health care for the elderly and pave the way toward healthy aging.

*Professor Mirjana Kujundžić Tiljak,*  
Director of the Andrija Štampar School of Public Health,  
Head of the Organizing Committee

*Academician Željko Reiner,*  
Head of the Scientific Committee

*Professor Marijan Klarica,*  
Dean of the University of Zagreb School of Medicine,  
Head of the Steering Committee

## INTRODUCTORY SPEECH

### “Demographic Challenges for Ageing Societies in the EU”

Dubravka Šuica

Vice-President of the European Commission for Democracy and Demography

*Ladies and gentlemen,*

It is a pleasure for me to speak to you today. The current COVID-19 pandemic brings a new light to this conference, that I was planning to attend in person in Zagreb back in April.

Let me start by thanking the School of Medicine of the University of Zagreb and the Croatian Ministry of Science and Education for their efforts in making today's event happen.

Speaking on behalf of the Commission, I am particularly happy that your work has benefitted from funding by Horizon 2020. This proves once again the importance of our funding and highlights the positive synergies it creates at EU level.

#### COVID-19

My address to you today is a partial preview of the Report I'm planning to publish this very month on the Impact of demographic change in the EU. In drafting it, I have devoted a particular attention to the trend of Ageing Societies in the EU and the set of challenges it brings in relation to health care, the provision of services or the social expenditure.

The Commission was on the frontline of the COVID19 fight already in January earlier this year when we invested €10 million EUROS in research. Since then, we have scaled-up our interventions. We may have had a slow start but we learnt from it and the real European Union stood up and showed its true self. EU finance ministers approved 500 billion euros to support the economy. This is vital. EU solidarity is also clear from the €800 million euros we have made available from the EU Solidarity Fund. The Coronavirus Global Response pledging event launched in May by President von der Leyen registered an initial EUR 7.4 billion in pledges from donors worldwide for collaborative development and universal deployment of diagnostics, treatments and vaccines. And the next step is the revamped MFF that will give the EU the additional firepower necessary to respond decisively to the most urgent challenges.

#### Demographic challenges

COVID19 highlighted the importance of addressing demographic challenges. First, the virus has not hit every Member State in the same way. A better understanding of a country's age structure, its population concentrations, household structures or intergenerational interactions can help predict the burden of critical cases and aid in more precise planning. Authorities at all levels are working on such plans and can benefit from this type of support and information. Currently all our efforts go into protecting our citizens and addressing the

negative consequences of the ongoing crisis. But we need to ensure that we put the European Union on a path of sustainable recovery and growth. So we must look at other key changes impacting our societies, such as the green and digital transformations and of course, demographic change. This is one of the areas I focus on in my role as Vice-President for Democracy and Demography.

## Demographic change

For the EU, what does demographic change mean today? It means an ageing population, low birth rates and decreasing working-age population. Changes in these areas significantly affect our economy, our social and employment policies, and public finance. Not to mention territorial cohesion. Addressing this impact on our citizens and regions is a key priority for this Commission. It has to be. Why?

The European Union's population is ageing. Over the last fifty years, life expectancy at birth has increased by about 10 years for both men and women. Yes, this is a great achievement. We are living longer with good living standards. However, living standards and social security are not the same everywhere. Approximately 31 million citizens live in low-income regions with a fast-declining population. Living longer in better health is one of the highest expectations of European citizens. This brings challenges and opportunities for individuals and societies – here, research and innovation have a role to play. We need to use our strengths and knowledge to prepare for the future in a wise way.

## Upcoming commission report

*Ladies and gentlemen,*

How can we best support people and regions to adapt to changing realities? Evidence in my upcoming Commission report on the impact of demographic change will help identify the people and regions most affected by demographic change. The report is the basis for a well-informed policy debate and paves the way for a green paper on ageing and a forthcoming long-term vision for rural areas.

This work on demographic change plays an important role in the aftermath of COVID-19 and in supporting long-term growth. Managing both the present and the future. I want your conference today to directly feed into the shaping of the Green paper on ageing that will launch the reflection – on EU level – on the demographic challenges linked to ageing societies in the EU.

## Healthy and active ageing

The Report I am about to publish, points to the fact that by 2070 only every second person will be of working age. We need to look at increasing labour market participation, through supporting people in remaining healthy and ensuring attitudes towards older members of the labour market are positive and constructive, while at the same time, facing the challenge of adapting our societies and social systems to the needs of the growing group of older people. Pensions play an important role in enabling older people to age with dignity. My report will demonstrate how important services are to older people, especially long-term care and health care. They are essential to their well-being and demand for these services will increase steeply with population ageing. They must be accessible, affordable and of good quality. Long-term care is the most important of them, along with health care. The European Social Fund and the European Regional and Development Fund are essential tools to cover current gaps. As the EU population ages, health care costs will likely increase from 6% of Gross Domestic Product

in 2020 to 7.5% in 2050. This in turn calls for increasing our reliance on prevention, community support and innovative practices. Active ageing has a role in addressing current and foreseeable needs of the older people. By fostering comprehensive policies that address health, safety, participation in work and volunteering activities, education, social and sport activity, there is a large potential for longer, healthier and more active lives.

### Ageing in light of COVID-19

The current health crisis has impacted the oldest members of our society disproportionately. Older people, especially those with chronic diseases and disabilities, are facing a much higher mortality rate due to COVID-19, compared to other age groups. Long-term care systems have been strongly affected by the pandemic. Figures about high mortality rates in care homes have highlighted the difficulties of long-term care systems in coping with the crisis. The pandemic further risks exacerbating loneliness and social isolation, making it more difficult to assist older people in health and social needs. Social distancing could also bring increased loneliness in particular for old people who live alone – the majority of which are women. It is at the heart of our European values to make sure our elderly receive the healthcare they deserve, in a non-discriminatory, respectful way. This means protecting and restoring health in the best possible way, but also fighting socio-economic difficulties, not least when it comes to isolation. Protecting the vulnerable is, and will remain, an essential part of our common European values.

### Research and innovation

In the COVID-19 crisis, we have pulled together to protect the weak and keep our health systems working. We are joining forces to deliver high quality and affordable healthcare innovations. Research and innovation in healthcare and health systems are key to ensure better protection of older people, achieve the breakthroughs needed by an ageing society, and provide evidence for policy responses to the demographic changes. As I already mentioned, our Coronavirus pledging event registered an initial EUR 7.4 billion from donors worldwide for development and deployment of diagnostics, treatments and vaccines. To help reach the objectives of the Coronavirus Global Response, EUR 1 billion will be mobilised under the EU flagship programme for research and innovation, Horizon 2020. Since January 2020, a total of EUR 352 million has already been mobilised under Horizon 2020., including for new research projects to advance understanding of the epidemic, contribute to more efficient clinical management of patients infected with the virus, as well as to public health preparedness and response.

Efforts do not stop here: a second call for expression of interest was published in May and I invite you to follow the updated, dedicated website. Healthy ageing can only be achieved with health promotion and disease prevention activities from early ages and throughout life, reducing the high economic burden of non-communicable diseases and reducing pressure on healthcare and social systems. Horizon 2020 supports key issues for healthy ageing of populations, such as (i) multi-morbidity, (ii) better rehabilitation, (iii) polypharmacy, (iv) preventing falls, and (v) studying social inequalities. The next Framework Programme, Horizon Europe (2021–2027), will further maximise the impacts of research and innovation for a healthier and more inclusive society. The digital transformation of health and care is another key aspect to support an ageing population, improve their quality of life and enable the economic sustainability of health and social care systems. Research and innovation will be crucial to deliver person-centred approaches to organising health and care. However, digitisation can also exacerbate inequalities as these tools are often less accessible in remote rural regions due to the

lack of high-speed internet connections and older adults also tend to have lower rates of digital literacy.

The European society, while ageing, has many positive aspects. This is reflected in the 'Silver Economy' that highlights the immense economical resource that Europe's older citizens constitute. The economic potential of the Silver Economy is very high in terms of technological innovation, investments, growth and jobs. It could also provide much needed solutions associated with ageing, such as promoting active life, health and well-being, transport, housing and much more. If we can gather the knowledge, good ideas and resources of Europeans, old and young, to find solutions and implement them, we will be able to build a stronger and safer European society for the future and a better future for healthy ageing, like the title of your conference rightly says.

### Concluding remarks

*Ladies and gentlemen,*

Let me conclude with this thought. COVID-19 has reminded us all that we live in a world of uncertainty and risk. Our best protection is to invest in resilience. Your conference today provides a much needed opportunity for us to discuss how, together, we can best stimulate research and innovation for the health and well-being of the ageing population – and more widely, how research and innovation can support more resilient societies. I look forward to your policy paper with recommendations to feed into my Green Paper on ageing, which I intend to proceed with after the adoption of my Demography Report. I am confident that this event will highly contribute to our reflection on how to ensure that we can all enjoy a healthy and active present and future, where no person and no region is left behind and how to ultimately create a better future in the EU for healthy ageing.

Thank you very much and looking forward to receiving your contribution to the reflections on ageing I'll be launching after the publication of my demography report.

## INTRODUCTORY SPEECH

Hans Henri P. Kluge

WHO Regional Director for Europe

*Honourable ministers, distinguished delegates, dear friends,*

It is a pleasure to speak to you at the opening of the “Better Future of Healthy Ageing” Conference.

The reason you are meeting virtually today, “to stimulate research, implementation and the scaling up of innovations to manage health and wellbeing of the ageing population” could not be timelier given the impact of COVID-19 on the lives and well-being of older people. I welcome the broader health scope of the Croatian Presidency that encompasses lifelong health care, demographic challenges and social policy. No one could have anticipated how critical these issues would be when the topic of the health of older people was chosen.

Let me also take this opportunity to thank you, the Member States of the European Union for your dedication and solidarity in fighting the pandemic, and for your unwavering support to WHO, underlined once again at the recent World Health Assembly.

COVID-19 has a firm grip on the 53 countries in the WHO European Region: it took nearly 3 months to reach 1 million cases in Europe, but just 5 weeks for that number to double. To date, there have been more than 2 million confirmed cases of COVID-19 across the Region, and sadly, over 180,000 people have lost their lives. For those who have lost loved ones, you have my deepest sympathy. Cumulatively, the European Region accounts for 36% of cases and 49% of deaths globally. The risk across all countries in the European Region remains very high.

For older people, the burden of COVID-19 is particularly heavy. While the median age of all reported cases is around 55 years, 94% of deaths are in those over the age of 60. Advanced age, underlying health conditions, possible cognitive challenges in understanding and following health and hygiene advice and navigating the infodemic of health advice, are all factors that can put older people at greater risk.

Yet in response to COVID-19 we have also seen incredible examples of innovation, resilience and collaboration for, with and by older people.

This pandemic has shone a spotlight on some of the overlooked and undervalued corners of our society – long-term care has often been notoriously neglected. But it should not be this way. We have a clear investment case for setting up integrated, person-centred long-term care systems in each country. The event you are attending today provides an invaluable opportunity to reach consensus on how we collectively transform health and care services to improve quality of life across the life-course, particularly for older people.

The WHO Regional Office for Europe has just released new technical guidance that outlines 10 policy objectives, illustrated by policy examples, which I hope can provide inspiration to create more resilient, better quality services for the future. WHO’s Second Global Action Plan on Ageing and Health, and the Decade of Healthy Ageing that runs from 2020–2030 also prioritize long-term care for older people, contributing to the 2030 Agenda for Sustainable Development and seeking to leave no one behind.

Beyond defeating the disease, the great test all countries will soon face is whether current feelings of common purpose will shape society after the crisis. Recovery must lead to a different economy – an economy of well-being where people are at the centre, and our later years are an opportunity to contribute, be valued, and lived in good health.

As Professor Andrija Stampar put it so well, “In the matter of people’s health, no distinction must be made between the economically strong and the weak”.

“U pitanju narodnog zdravlja ne smije se činiti razlika među ekonomski jakim i slabim”

I wish you a successful conference.

## Speech of Deputy Speaker of the Croatian Parliament and president of the Scientific Committee Željko Reiner at a Conference “Better Future of Healthy Ageing 2020”

3 June 2020

*Dear professor Mirjana Kujundžić Tiljak, President of the BFHA2020 Organizing Committee*

*Dear professor Marijan Klarica, Dean of the School of Medicine, University of Zagreb and co-president of the BFHA2020 Organizing Committee*

*Dear professor Damir Boras, Rector of the University of Zagreb,*

*Dear Dr Kluge, WHO Regional Director for Europe,*

*Dear professor Figueras,*

*Dear Ministers*

*Honourable Vice-President of the European Commission, Mme. Dubravka Šuica,*

*Esteemed colleagues,*

*Ladies and gentlemen,*

At the very beginning, I must emphasize how happy I am to have a chance to greet you in Andrija Štampar School of Public Health. Dr. Andrija Štampar was internationally recognized leader in the field of social medicine and public health, known worldwide as one of the founders of the World Health Organization. During the pandemic caused by the novel coronavirus, Croatia's results in combating COVID 19 disease are excellent, largely due to the fact that Croatia is one of the worlds' leaders in promoting and protecting public health, mostly thanks to dr. Štampar.

With ageing of the population, the public health policy agenda oriented towards healthy ageing becomes the highest priority for the European countries. Promotion and education about healthy and active aging have become a standard in every developed country. It aims to reduce morbidity of the elderly especially for preventable diseases, increase the quality of life and overall happiness and satisfaction of older people.

But, how can we achieve healthy ageing? That is a question which we rarely asked ourselves when we were younger. We were healthy, but apparently we were ageing. We didn't notice this at the time. Which reminds me of a saying of the British writer Sir Terry Pratchett: “Inside every old person is a young person wondering what happened.”

Croatia's population, as well as a big part of the whole Europe's, consists of about 20% of population over 65. This phenomenon of aging of Europe, also known as the *greying of Europe*, is characterised by a decrease in fertility, a decrease in mortality rate, and a higher life expectancy among European populations. Analysts predict that the median age in Europe will increase from 37.7 years old in 2003 to 52.3 years old by 2050. This gives a whole new meaning to the known phrase “The Old Continent”.

Ageing affects our societies at numerous levels. I'll focus on 3 of them:

- Socioeconomic
- Political
- and Bioethical.

The **socioeconomic** consequences of aging of the population affect all aspects of the society including health, social security, education, socio-cultural activities, family life and the labour market. The total number of the older population will increase even further in the near future, with the peak of the post-war baby-boom generations reaching retirement age between their 65 and 75 years. This will cause a high burden on the working age population as they provide for the increasing number of the older population. Throughout history many states have worked to keep high birth rates in order to have moderate taxes, more economic activity and more troops for their military. But since the fertility rate is decreasing, this is no longer an option.

This is why many governments consider increasing retirement age in order to stabilize labour market. Why should we dismiss knowledge and skills of a 65-year-old just because he, or she, has to be retired? And especially if he, or she, wishes to continue working and has the mental capabilities and health to keep working? It gives older adults a feeling of purpose, satisfaction and contribution to the society – ensuring them a happier and healthier ageing. As the famous actress Ingrid Bergman once said: “Getting old is like climbing a mountain; you get a little out of breath, but the view is much better!”

Ageing of population affects **political** structures of society more than it seems at first glance. If you think about 20% of your country’s population – people 65 years of age and older – you just have to consider them as a huge part of voters and an interested public for your policies. Every serious political party or platform should focus on wellbeing of this part of their population as well.

People over 65 and particularly those older than this age have different social, economic, and medical needs than children or adults who are still in the workforce. Governments will have to adapt to their changing demographics, and it’s not clear yet how to do so. One way to start would be to look at nations that already seem to be handling these transitions well. Two years ago a team of researchers and policy experts ranked OECD countries with best practises when it comes to looking after their elderly. Their work put Norway at the top, followed by Sweden, the US, and the Netherlands. They came to a conclusion that policy makers should focus on exploring opportunities for elderly people to contribute to society, calculate efficient retirement age, support and enable employment for people over 65 and so on. However, it is interesting that exactly some of these countries are among those with the highest death rate per million inhabitants in CORONA-19 pandemic, with particularly high numbers of deaths among older citizens.

Croatia is a young democracy. Through the past 30 years we had to switch to a completely new political structure, we had to, let’s say, start from the beginning. It’s hard to compete with old democracies such as, for example, Scandinavian countries. But, we are very aware that older adults are a big and important part of our society. We always bear in mind the words of Mark Twain: “Age is an issue of mind over matter. If you don’t mind, it doesn’t matter.” Pension reform was one of the priorities of the current Croatian Government, and it gave us impetus for further work in this area.

**Bioethical** effect of ageing on our societies is most familiar to all of us, because it consists of emotional components, our affection to our ancestors, grandparents and parents. We should all look at ageing through this prism, because it could make us better people. As a medical doctor I put a strong focus on empathy and consideration when treating elderly patients. As a University professor, I try to teach my students, future doctors, the values of altruism and empathy. In the coronavirus pandemic we have witnessed unimaginable situations around the world, due to shortage of ventilators, where doctors were forced to choose which patient will be treated with a ventilator – an old one, or a young one. In some countries doctors have been

prioritising younger over older patients to determine who gets not only the ventilator but also the intensive care unit bed first. No one should be put in such a situation. My thoughts are with doctors who were forced to make such painful decisions.

Some cultures treat their elderly with more respect and dignity than the others. “Respect your elders”, they say. For example, in Japan, seniors are highly respected. Japan even has a national holiday called “Respect for the Aged Day” to show appreciation for seniors. China and India also honour their elders. Most countries have an appreciation for their elders, but unfortunately elderly are still a subject to prejudice and stereotyping in many societies. Many older adults around the world struggle with feelings of helplessness and hopelessness. Symptoms of elderly depression can affect every aspect of their life, impacting their energy, appetite, sleep, and interest in work, hobbies, and relationships. Unfortunately, too many depressed older adults fail to recognize the symptoms of depression, or don’t take the steps to get the help they need. Their depression is also not recognized by their families and acquaintances, which leads to assuming that ageing is sickness, *per se*.

*Ladies and gentlemen,*

We should use all our resources and knowledge to encourage healthy ageing. Modern technologies and IT sector can contribute to wellbeing of the elderly. More developed countries exploit those resources to its maximum already!

The ongoing pandemic showed us that humans are a weak link in the chain of Earth’s life. I have mixed feeling regarding this issue, because, although I’m fascinated by the development of technologies, especially smart technologies and artificial intelligence, I somehow fear that nature will find a way to fight back.

I’d like to end my address by two simple words: coexistence and respect. To the nature, and to ourselves, of course including our older citizens.



**BFHA**  
2020



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**BETTER FUTURE of HEALTHY AGEING 2020**

## **Keynote Speakers**







K-I

## Economic, Fiscal and Societal Consequences of Population Ageing – Looming Catastrophe or Fake News?

Jonathan Cylus<sup>1,2,3</sup>, Gemma Williams<sup>1,2</sup>,  
Charles Normand<sup>4,5</sup>, Josep Figueras<sup>1</sup>

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<sup>2</sup>London School of Economics & Political Science, United Kingdom

<sup>3</sup>London School of Hygiene & Tropical Medicine, United Kingdom

<sup>4</sup>Trinity College Dublin, Republic of Ireland

<sup>5</sup>King's College London, United Kingdom

Population ageing is often perceived negatively from an economic standpoint. Yet, taking a more balanced view, it becomes evident that an increasingly older population is not necessarily very costly to care for and that older people provide significant economic and societal benefits – particularly if they are healthy and active. In this brief article we consider key policy questions associated with population ageing, bringing together the latest evidence. We review what is known about the health and long-term care costs of older people, and consider many of the economic and societal benefits of healthy ageing. We also explore policy options within the health and long-term care sectors, as well as other areas beyond the care sector, which either minimize avoidable health and long-term care costs, support older people so that they can continue to contribute meaningfully to society, or otherwise contribute to the sustainability of care systems and the wider public sector in the context of changing age demographics.

### Introduction

By 2050, nearly every country will experience an increase in the share of their population over age 60 due to reductions in fertility rates, coupled with declines in both infant mortality and premature deaths that have enabled longer life expectancies(1). High-income countries in particular are seeing sizeable increases in the oldest old, those people 80 years and older.

Such population ageing presents both challenges and opportunities for societies around the world (2, 3). As the share of the population at older ages increases, there are concerns over how to respond to greater health and long-term care needs and how to cope with the possible economic and fiscal implications of hav-

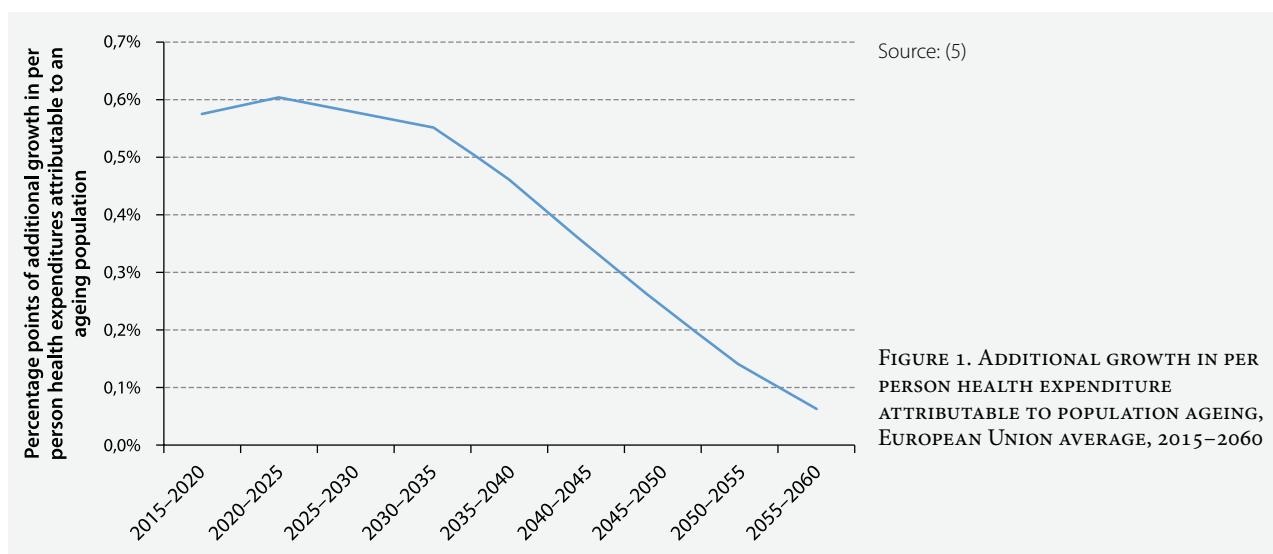
ing a smaller share of people at traditional working ages. Many perceive that a changing population age-structure will have inevitable consequences for households, public finances and possibly even for economic growth and development.

However, evidence suggests that many of the commonly considered macro effects of population ageing are exaggerated and that there are a range of appropriate policy responses that can help avoid the worst outcomes commonly associated with population ageing. First, while ageing will bring higher needs for and costs of care, population ageing is not and will not become a primary driver of health expenditure patterns. The additional demands on the health system coming from a larger older population can in part be moderated with better choices and configurations in health and social care. Likewise, although population ageing will lead to changes in economic behaviours (and in turn the ability to generate public sector revenues through taxations), there are a number of strategies that can mitigate the effects on public finances. Lastly, the evidence suggests that while many older people leave the formal labour market, older people can provide significant economic and societal benefits – particularly if they are healthy and active –through both paid and unpaid work, including caring for other older people.

To manage the challenges and to take advantage of the opportunities afforded by population ageing, policy makers must act across a range of domains such as, on work and employment, on income security, on promoting healthier lifestyles and on developing new and more efficient models of care. This short article aims to provide a balanced summary of the evidence, drawing on some of the work from the European Observatory on Health Systems and Policies programme on the Economics of Healthy & Active Ageing.

### What are the implications of population ageing for health and long-term care expenditures?

In general, on a per person basis, health and long-term care needs and expenditures increase with age. This contributes to concerns that an ageing population will rapidly accelerate health expenditure growth rates. It should be noted, however, that there are important differences across countries in how much is spent on health per person for older people. For example, according to health care spending by age data collected for countries in the European Union (EU) by the



Working Group on Ageing Populations and Sustainability (AWG) of the European Commission, in 2015, health care spending for the average 80-year-old in Hungary were almost 16 times higher than spending on the average 20-year-old in Hungary, but this difference was only 2.7-fold in Cyprus(4).

Despite this typical pattern of higher health care spending on older people, available data show that population ageing has in fact a relatively modest effect on health care expenditure trends compared to other important historical drivers of health expenditure growth, such as prices or technological innovation. Changes in population age structure alone are expected to add less than one additional percentage point to the average annual per person health care expenditure growth rates between 2010 and 2060 in the average EU country (Figure 1). Population ageing is simply too gradual a process to rapidly accelerate health care expenditure growth.

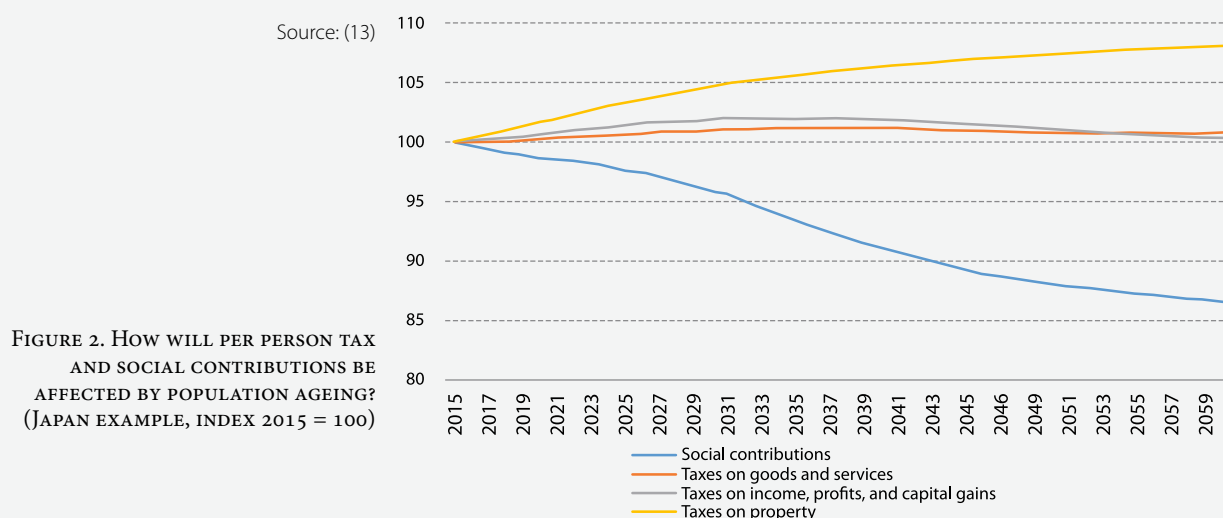
Additionally, much of the evidence suggests that calendar age itself is not the primary reason for higher health care spending associated with older ages anyways. Rather, related factors such as proximity to death and poor health are more important determinants of health spending (6–8). Poor health and disability are important drivers of health care expenditure trends at all ages, not just among older people. Likewise, although health care spending increases rapidly in the final months of life, there is research showing that beginning at some age, the older people are when they die, the lower their health spending is near the end of their life(7) (9). This is likely due to lower use of resource-intensive interventions in older ages (although it may also reflect discriminatory practices and ageism). Therefore, as longevity increases, it is possible that the health care costs of older people relative to younger people will actually fall, especially if older

people live in better health, thereby reducing the otherwise expected effects of population ageing on total health care expenditure growth in the future.

It is worth noting that the presence of a formal or informal long-term care system may be another reason behind declining health care expenditures among the oldest old, as costs are shifted outside of the traditional health care sector into other settings. Where formal long-term care is available, its costs are expected to increase rapidly as a result of population ageing. However, this growth in spending on long-term care is coming from a low baseline in most countries. The majority of Organisation for Economic Co-operation and Development (OECD) countries with data available currently spend less than 2% of gross domestic product (GDP) on long-term care, which means that even large increases in spending are unlikely to consume a large share of resources.

### How will population ageing affect the ability to generate revenues for health and the public sector more broadly?

There is a common belief that older people are ‘dependent’ on the financial support of society, particularly younger people in paid employment who fund the public sector through their taxes. This misconception is reinforced by traditional metrics like the old-age support ratios, which assume that all people over a certain age threshold (usually age 65) depend on the support of all adults below it. However, not all people over 65 retire and/or are dependent and many people stop paid work below the age of 65. Alternative approaches to measuring support ratios attempt either to more properly account for changes in population health and disability (though few studies measure care or functional dependency states), or for changes in the



number of consumers and producers in the population(10) (11). These refined indicators suggest that population ageing will create significantly fewer dependency related challenges than anticipated. For example, estimates from the United Kingdom suggest that while the traditional old-age support ratio will increase from 27% (2005–10) to 41% (2045–50), the share of the adult population with disability will stay unchanged at 10% during the same period.

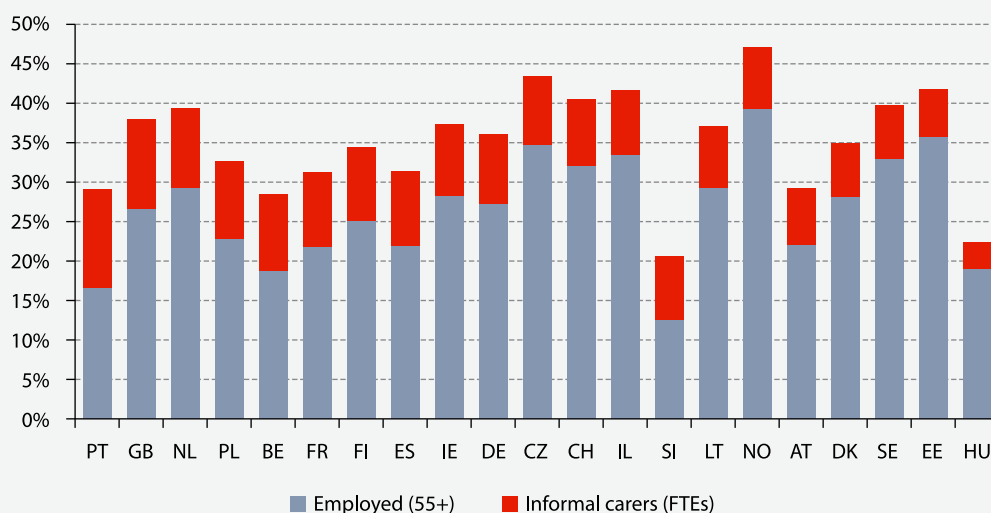
It is important to move even further beyond old-age support ratios to have a clearer sense of how population ageing affects the ability to generate public sector revenues. In European countries, the main sources of public sector revenues are income taxes, goods and services taxes, property taxes, and social contributions. As populations age, countries will likely experience changes in the ability to generate revenues from each of these sources. Older people on average contribute less to public-sector revenues than working-age people as they leave the formal labour market, although they do still contribute significant amounts through taxation. For example, older people who are not in paid work continue to pay goods and services taxes as well as taxes on non-labour income and assets (e.g. property). These may still be significant shares of public sector revenues: tax revenues generated from purely non-income sources (i.e. non-labour, but also capital gains which may be earned by older people) comprise around 30% to upwards of 50% of tax revenues in OECD countries (12).

Simulations allow us to quantify precisely how population ageing affects the ability to generate public sector revenues from different revenue sources. Using population data from Japan, where a large share of the population is already at older ages and increasingly exiting the formal labour market over time, estimates suggest that relying on social contributions primarily

generated from the labour market to raise public sector revenues and pay for health and other services results in declining revenues per person over the coming decades (13). Other forms of taxation, such as taxes on goods and services or income taxes appear less susceptible to population ageing, while property taxes may even increase as the age-structure of the population shifts (Figure 2).

Possible policy options to address declines in labour-related social contributions due to population ageing include: increasing the number of contributors; increasing the contribution rate on social contributions; and diversifying the mix of financing sources. However, for countries that depend heavily on the labour market to finance health, none of these policy options on its own is likely to make up for the shortfall in revenues due to population ageing according to simulations. Declining social contribution revenues can be expected even if the revenue base were broadened or if contribution rates were raised equally across all age groups. Diversifying the mix of revenue sources in favour of sources that are less affected by ageing may be an appropriate solution. However, countries will likely still need to reprioritize their current public-sector budgets and allocate more resources to health, or increase tax rates on alternative revenue generation sources in order to maintain sufficient and stable revenues for health(13).

This type of analysis demonstrates that sustainable revenue generation is possible in the context of population ageing, but it underscores the importance of moving away from financing the health system and public sector more broadly through labour-related contributions and premiums and instead relying more on general non-earmarked taxation as the population ages.



Source: Author's calculation based on ESS, 2014 [31].

Notes: Sorted by size of workforce in informal caregiving.

FIGURE 3. PARTICIPATION IN PAID EMPLOYMENT AND FULL TIME EQUIVALENT (FTE) INFORMAL CAREGIVING AMONG THE 55+, SELECTED EUROPEAN COUNTRIES

### What are the implications of population ageing for paid and unpaid work?

While population ageing will likely lead to changes in economic behaviours that have consequences for public sector revenues, as discussed above, there remains great scope for older people to contribute meaningfully to society and the economy through both paid and unpaid work, particularly if they are healthy and able to remain active. Although many people leave paid employment in their 60s, others do remain in paid work (14). Comparatively older workers have historically produced less economic output than younger workers, however this may reflect labour market realities that are no longer valid, such as requiring the capacity to carry out physically demanding work. There are important differences in how productivity changes over the life course by type of occupation; for example, jobs requiring less physical exertion may benefit from additional years of experience where skills continuously improve with age, and more experience often improves the quality of the work. Even if older workers are slightly less productive (which may be due to discriminatory practices and ageism, such as poorer access to training at older ages), they are still able to make a positive economic contribution compared to if they are not working at all. In fact, empirical evidence suggests that on average many people have considerable health capacity to continue to engage in the formal labour market at older ages (15, 16).

Many older people produce unrecognized economic and societal value through unpaid work. One of the most relevant forms of unpaid work is informal care-

giving. If national statistics accounted for informal carers (adjusted for full-time equivalency (FTE)) it would have a substantial effect on measured employment rates of older people. For example, among the population aged 55+ in Portugal, including informal carers would have increased the employment rate by nearly 13 percentage points in 2014 (Figure 3). Methods to monetize the value of unpaid informal caregiving also demonstrate its considerable economic value, with one study in Spain suggesting the value of informal caregiving being in excess of 2% of GDP (17). However, informal care, especially if it is very demanding on those providing it is not without cost, and the availability of informal caregiving depends in part on the supports given to carers and the availability of complementary formal care.

Provision of informal care by older people also has knock-on effects on formal employment rates, for example, of adult children. If older people are able to provide informal care to dependent older people or care for grandchildren, adult children who would otherwise be providing care may be able to work in paid employment. This is an important channel through which older people contribute to the economy that remains invisible in national statistics.

### The policy options: how can decision-makers respond to population ageing?

The health care and long-term care costs of older people, as well as the ability of older people to contribute meaningfully to society and the economy are de-

pendent on a number of factors, many of which are amenable to policy intervention. Undoubtedly, health and functional ability are of utmost importance. This is because of their intrinsic value as well as their indirect effects on the economy via their impacts on reducing care costs and promoting the ability of older people to contribute. Healthy older people require less intensive and expensive care; they are able to engage in paid or unpaid work if they choose to do so; and they accumulate greater asset wealth compared to unhealthy people. Policy-makers can employ a range of policies and strategies in order to control costs of care and enhance economic and societal contributions of older people, ensuring that population ageing does not lead to undue economic pressures. Examples of such interventions, both indirect (via improvements in health and functional ability) and direct, are summarized below.

### *Policies to promote healthy and active ageing*

The types of interventions that support health and activity at older ages include those that delay the onset and progression of disease, as well as those that prevent or delay care dependency. Importantly, policies which encourage behavioural changes can have significant health effects even if those changes do not occur until older ages. For example, there is good evidence that those who quit smoking at age 65 live longer than those who continue to smoke. To prevent dependency, a key focus should be on preventing cognitive decline, where there is some evidence that taking a multidomain approach can improve or maintain functionality. Other interventions to prevent or reduce frailty, such as resistance training or promoting physical activity at older ages, can also be effective.

### *Policies to promote cost-effective health and long-term care interventions*

Technological advancements, such as telemedicine, as well as assistive technologies, such as digital memory aids or automated medication dispensers, can be effective ways to provide care using relatively low resource levels. There has also been widespread interest in integration of health and long-term care and other models of care delivery to help control care costs, particularly given the complex care needs of older populations. There are many varied examples of delivering coordinated or integrated health and long-term care. There is also good evidence that supporting better treatment and care choices near the end of life can reduce the use of unnecessary treatments and tests, lower costs, improve the experiences of patients and carers and even, in some cases, contribute to longer survival.

### *Policies to support acceptable, equitable and efficient funding and income transfers*

Given likely reductions in the share of the population in paid work as a result of population ageing, health and long-term care financing systems may need to diversify their sources of revenue if they are to continue to generate sufficient, stable resources. For example, health and long-term care financing systems that are heavily reliant on payroll contributions may need to be redesigned to fill the financing gap from general revenues or private sources.

Increasing the reliance on locally raised taxes or, conversely, centrally raised taxes is one focus of ongoing debate and reforms, with countries moving in different directions. The use of hypothecation (or earmarking) of payroll or 'sin' taxes has been seen by some as a potential source of funding. However, many argue that this introduces unwelcome budgetary controls and that spending is ultimately determined by revenue generated rather than based on changing needs and demand. Earmarked funding sources are also likely to be susceptible to economic fluctuations, resulting in unstable revenue streams. Similar arguments have been made against the introduction of mandatory long-term care insurance arrangements, such as those seen in Germany, Japan and Korea. Overall, acceptability of higher taxes and transfers varies between countries and can depend in part on the transparency of the process and the perceived fairness of the rules.

### *Policies to support paid and unpaid work*

While there is widespread interest in keeping people in paid work for longer, raising pension ages alone may simply divert some older people into other state support for unemployed people or people with disabilities if they are not healthy enough to work productively. Health systems can usefully help to keep older people healthy and able to remain in the workforce. There is also growing recognition that workplace health promotion interventions, such as screening activities to identify potential health risks and lifestyle management activities to improve health and health behaviours, can keep older workers healthy and productive. Adapting work practices to accommodate older workers' needs and circumstances can also help older people to remain in work. Good evidence shows that flexible working practices, such as flexitime, part-time working, job-sharing and working from home, can help older people, particularly those with health issues or caring responsibilities, to remain in employment for longer and can result in healthier lives overall. Changes to the physical work environment can also support older workers to remain in employment, while contributing to improvements in productivity.

On the unpaid work side, strategies that support informal carers through training or by providing cash for care have been shown to reduce carers' stress and may also improve the quality of care. However, it is important to acknowledge that cash-for-care benefits can act as a disincentive to participating in formal employment. Much emphasis has been placed on implementing reforms to enable carers to combine unpaid care with paid employment, including the introduction of paid or unpaid leave and flexible working arrangements.

### Conclusion

Policy-makers require high-quality information to make informed decisions and develop policies with respect to older people. This overview of evidence on some of the costs and benefits associated with population ageing suggests that older people are likely to be less costly to societies than often perceived, at least in terms of health and long-term care. Older people also provide benefits that are frequently not quantified, such as in the form of informal caregiving, while others remain in paid work at older ages, particularly if they are healthy enough and choose to do so.

There are many benefits from investing in the health of older people, not least for the sake of economic growth and sustainable public finances. Any questions regarding the costs of interventions to support the health and activity of older people should take into account the potential benefits not only from an economic perspective, but also in terms of improving quality of life and experiences in older age. As has been described above, these sorts of benefits are often not properly taken into account.

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## K-II

## Geroprotectors: Time to Change the Way We Take Care of Older People?

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The Medical School Sheffield, United Kingdom

Human life expectancy has been increasing steadily over the last century but this has resulted in an increasing incidence of age-related chronic diseases. Patients often present with more than one disease at the same time (multimorbidity) and develop frailty. Multimorbidity and frailty have complex medical needs and are strongly associated with disability and hospitalization. However, current treatments are suboptimal with problems of polypharmacy due to the fact that each disease is treated individually.

Geroprotectors target fundamental mechanisms of ageing common to multiple age-related diseases and shows promise in delaying the onset of multimorbidity in animal models. I will present preclinical data on a new geroprotector, Zoledronate (1), together with the recommendations from the European network Mouse-AGE and Healthy Lifespan Institute thinking on the steps required to ensure these new interventions are translated from the bench to the bedside

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## K-III

## Importance of Sleep for Healthy Ageing – Impact of Sleep-Disordered Breathing

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### Abstract

Sleep Medicine is growing multidisciplinary field within the biomedicine and health. According to the International Classification of Sleep Disorders 3 (ICSD-3), there are about 80 sleep disorders, divided into 6 different clinical divisions: insomnia, sleep-related breathing disorders, central disorders of hypersomnolence, circadian rhythm sleep-wake disorders,

parasomnia, sleep-related movement disorders, as well as “other sleep disorders”. Some sleep disorders are strongly associated with specific age and they appear almost exclusively in childhood or in the elderly, but most sleep disorders may appear in all age groups. However, the prevalence is significantly positively associated with ageing. Also, there is a significant negative correlation of sleep duration and sleep quality with age, but the impact of poor sleep quality and sleep disorders on health, healthy ageing and quality of life is not recognized enough, and the public awareness is not at the satisfactory level. It is important to state that general statements about sleep architecture and sleep stages proportions in the total sleep time presented in the literature can only be made regarding sleep in the normal young adult without sleep complaints who is living on a conventional sleep-wake schedule. One of the most notable findings regarding sleep in the elderly is the profound increase in inter-individual variability, which thus precludes generalizations such as those made for young adults.

The most prevalent sleep disorders of today, such as insomnia or sleep-related breathing disorders are strongly positively associated with age and make one of the most important risk factors for diminished quality of life, as well as increased morbidity and mortality of the most prevalent diseases in general population, such as cardiovascular and glucose metabolism disorders, but also cancer, which has been published in many recent studies. Also, cognitive and psychomotor impairments are facilitated in the elderly in the presence of sleep disorders.

Increasing public awareness, improving and expanding diagnostic and treatment capacities for sleep disorders, as well as education of sleep medicine experts, which was recently developed in the Republic of Croatia according to European guidelines, are the primary goals of up-to-date sleep medicine, one of the most prosperous medical discipline, which is going to be even more important in the future due to increased longevity in general population and strong links of sleep medicine and ageing.

### Sleep

There are many definitions of sleep. According to a simple behavioral definition, sleep is a reversible behavioral state of perceptual disengagement from and relative unresponsiveness to the environment. It is also true that sleep is a complex amalgam of physiologic and behavioral processes. Sleep is typically (but not necessarily) accompanied by postural recumbence, behavioral quiescence, closed eyes, and all the other indicators that one commonly associates with sleeping (Carskadon and Dement, 2011). We spend nearly one-third of our lives asleep, and many mammals, includ-

ing small laboratory rodents, spend half or more of their existence in this state.

The sleep-wake cycle is regulated by two separate biological mechanisms, which interact together and balance each other. This model is often referred to as the *two-process model* of sleep-wake regulation composed of the Process C that reflects the *circadian rhythm*, and the Process S that reflects the *sleep-wake homeostasis* (Borbély, 1982).

There are two distinct states of sleep, defined on the basis of several physiologic parameters. Rapid eye movement (REM) and non-REM (NREM) sleep exist in most mammals studied. These states are both different from wakefulness and distinct from one another (Dogas et al., 2014). However, differentiating sleep (or sleep stages) from quiet wakefulness is hardly possible at the behavioral level. NREM sleep, formerly subdivided into four stages according to standard Rechtschaffen & Kales (R&K) sleep scoring rules (Rechtschaffen and Kales, 1968), is currently distinguished into three stages according to the American Academy of Sleep Medicine (AASM) scoring rules (Iber et al., 2007; Berry et al., 2014). Those stages are mostly defined based on the electroencephalogram (EEG). The EEG pattern in NREM sleep is commonly described as synchronous, with characteristic waveforms such as sleep spindles, K-complexes, and high-voltage slow waves. NREM stages (stages 1, 2, 3, and 4 according to R&K, and stages 1, 2, 3 according to AASM, stage 3 according to AASM being composed of stages 3 and 4 according to R&K) represent a depth-of-sleep continuum, where the arousal threshold is generally lowest in stage 1 and highest in stage 3 (or 4) sleep. Classical studies showed that the sound intensity needed to awake a subject is positively correlated with the depth of sleep. That is, during deep sleep characterized by the slow wave activity as seen in the EEG (hence the name “*slow wave sleep*”), sound intensity had to be greatest to lead to awakening. In traditional perspective, NREM sleep was usually associated with reduced mental activity. However, recent studies showed it is not the case, as for instance there are strong associations between NREM sleep and memory consolidation processes.

Importantly, general statements about sleep stages proportions in the total sleep time presented in the literature can only be made regarding sleep in the normal young adult without sleep complaints who is living on a conventional sleep-wake schedule. One of the most notable findings regarding sleep in the elderly is the profound increase in inter-individual variability, which thus precludes generalizations such as those made for young adults (Carskadon and Dement, 2011).

## Chronotypes and sleep

In humans, the most obvious variation in behavior organization, during the 24-hour day, can be seen in their preferred timing of sleep and wakefulness. Total amount and the timing of sleep are determined by several factors, including environmental factors, endogenous circadian rhythms and time awake. Human preferences in the timing of sleep and wake are called “chronotypes” and are at least partly based on genetics. Human chronotypes can be easily investigated using convenient self reported questionnaires, such as Horne-Ostberg morningness-eveningness questionnaire (Horne and Ostberg, 1976), and Munich Chrono Type Questionnaire, that differentiate timing of the daily activities during workdays versus free days (Roenneberg et al., 2007). Chronotypes (morningness–eveningness) are one of the most common inter-individual differences in circadian rhythmicity. As such, chronotype represents a phenotypic aspect of the circadian rhythmicity. Morning-type and evening-type persons differ in endogenous circadian phase of their biological clocks (Roenneberg et al., 2007). Moreover, it is well known that diurnal preferences (morningness–eveningness) are influenced by person’s gender, showing a greater shift toward morningness in women than in men. They are driven by reproductive hormones and thus endogenously generated. Sex differences in human chronotypes disappear at approximately age of 50 (Roenneberg et al., 2007).

Diurnal preferences are associated with age, as well. Although thought to be primarily a genetic trait, it is well established that chronotype is not constant throughout the adult lifespan. During the childhood, children are more morning-types, while during the adolescence change in chronotype occurs, shifting adolescents towards eveningness-types. Also, it has been found in cross-sectional studies that chronotype changes towards a morning-type orientation with advancing age (Monk and Buysse, 2014). The biological foundation of this has been confirmed by laboratory studies showing that older adults (seniors) have circadian rhythms, which phase at an earlier clock time (usually by 1–2 h) than those of younger adults (Monk and Buysse, 2014).

## Sleep and age

Sleep is an important component for health and wellness across the lifespan. However, older adults do not sleep as well as younger adults. Why? What alterations in sleep quantity and quality occur as we age, and are there functional consequences? What are the underlying neural mechanisms that explain age-related sleep disruption? There are well-known changes in human sleep quantity and quality in cognitively nor-

mal older adults and the functional consequences of age-related sleep disruptions. However, there is a still-debated question: do older adults simply need less sleep, or rather, are they unable to generate the sleep that they still need? (Mander *et al.*, 2017).

Sleep disturbances are a common presenting symptom of older-age adults to their physicians. There are normal changes in sleep pattern with ageing and primary sleep disorders in the elderly, but behavioral factors and primary psychiatric disorders affecting sleep in this population are numerous.

### Normal age-related changes to sleep-wake physiology

Physicians addressing sleep complaints in older adults are commonly asked about how much sleep is enough. The National Sleep Foundation recommends 7–8 hours of sleep for adults aged 65 and older. This recommendation is supported by evidence that older adults sleeping anywhere from 6–9 hours have better cognition, mental and physical health, and quality of life compared to older adults with shorter or longer sleep durations. Thus, the need for sleep is not reduced in older adults, but the ability to get the required sleep may be decreased due to normal changes in sleep architecture through the lifespan. Age-related changes in sleep physiology have been well-documented using polysomnography. Most age-dependent changes in sleep parameters occur by age 60 years, with the exception of sleep efficiency. Sleep efficiency (percentage of time spent asleep while in bed), on the other hand, continues to show an age-dependent decline beyond age 90 years. Older adults also have a decline in total sleep time, with corresponding decreases in the percentage of time in slow wave sleep (SWS or N3) and rapid eye movement (REM) sleep. SWS and REM sleep are thought to promote metabolic and cognitive recovery, and to enhance learning and memory, respectively. Older adults also have an increase in time awake after sleep onset (WASO). While the number of arousals from sleep increase in healthy older adults, evidence suggests they do not have greater difficulty falling back to sleep. There is an increase in sleep latency (the time it takes to fall asleep) up to age 60, with no clear age effect beyond that point (Monk, 2005).

### Circadian rhythm in elderly

Circadian rhythms also change over the lifespan. These rhythms are 24-hour intrinsic physiological cycles that are involved in control of sleep-wake and many other physiologic processes (e.g. blood pressure, bone remodeling, release of certain hormones). Ageing is associated with a phase advance, resulting in an earlier onset of sleepiness in the evening and earlier morning awakening. Daytime wakefulness is affected

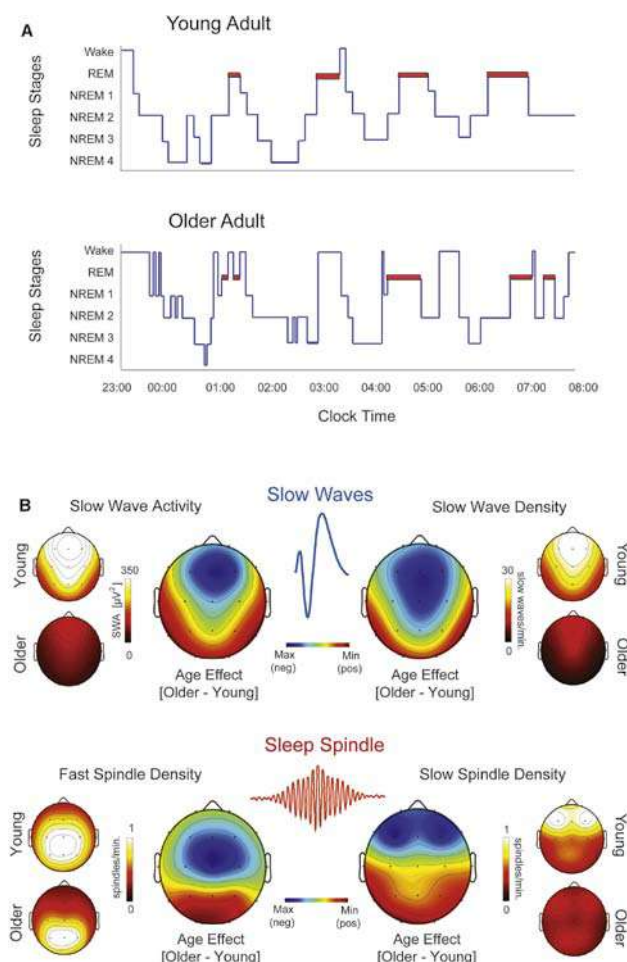
by phase advance, with older adults being more alert in the morning and more somnolent in the evening. Studies conducted in different age groups revealed that adolescents and elderly population are two populations predominantly at the risk of circadian rhythms disorders. Adolescents go to bed considerably later in the evening. This is mostly pronounced during working days and associated with sleep rebound, characterized by extended time spent in bed on weekends. Changes in circadian rhythm associated with advanced age include a tendency to sleep earlier and shift toward morning type, with an increased number of naps during daytime (Park *et al.*, 2002). While napping is common in older adults, results with regard to the benefit or harm of this practice are mixed. Some studies show beneficial and potentially protective effects of napping in later life, while others show it to be a risk factor for morbidity and mortality. There is some evidence to suggest that naps are protective for mortality if nighttime sleep duration is short, but are associated with increased mortality risk if nighttime sleep duration is longer than nine hours.

Changes in circadian rhythms are associated with a decline in sleep quality due to increased sleep latency and more pronounced sleep fragmentation during the night, emphasizing weakened and fragmented circadian rhythms during ageing (Huang *et al.*, Bliwise *et al.*, 2005).

### Sleep, Ageing and Gender

Though reliable macro and micro sleep differences exist between younger and older adults, not all older adults suffer the same degree of sleep disruption. Instead, there is large inter-individual variability. This means that age per se is not the sole determinant of sleep disruption in later life. Rather, factors that interact with the aging process must confer vulnerability or resilience to age-associated declines in sleep quantity and quality.

In the context of older age, one such interacting factor is gender. Men experience far greater relative disruption and impairment in NREM sleep than women later in life. In a study comparing over 2,500 older adults between the ages of 37 and 92 (Redline *et al.*, 2004), increasing age was reliably associated with the same features described above: decreased slow wave sleep time, reduced sleep efficiency, increased NREM stage 1 sleep time, increased number of arousals, and modest decreases in REM sleep time. However, when stratified by gender, differences emerged. Men over the age of 70 demonstrated a highly significant 50% reduction in slow wave sleep, relative to men under the age of 55, together with a concomitant increase in lighter NREM stages 1 and 2. In contrast, women showed no such significant decline in slow wave sleep or increase in lighter NREM sleep time relative to their younger



(A) Prototypical sleep stage architecture across a 9 hr sleep period in a younger adult (top) and an older adult (bottom), using classic sleep staging criteria (Rechtschaffen and Kales, 1968). Relative to younger adults, older adults demonstrate: longer sleep latency, a greater number of transitions to lighter stages of sleep and wakefulness, more time spent awake after sleep onset, more fragmented sleep, and less time in slow wave sleep, especially within the early sleep cycles.

(B) Upper: Representative topographical head plots of EEG-quantified differences between younger and older adults in slow wave activity (left upper) and density (right upper). A similar sleep spindle density for fast sleep spindles (13.5–15 Hz; bottom left) and slow sleep spindles (12–13.5 Hz; bottom right) is shown in the bottom image. The hotter colors represent higher values. The center rainbow topoplots in each image represent the subtracted difference between younger and older adults, with darker blue representing larger deficits in older relative to younger adults. For both slow waves and sleep spindles, older adults demonstrate the largest regional oscillation impairments over frontal EEG derivations (From Mander *et al.*, 2017; the data are adapted from previous reports Mander *et al.*, 2013, 2014, 2015, 2016b).

FIGURE 1. SCHEMATIC OF AGE-RELATED CHANGES IN SLEEP ARCHITECTURE AND NREM SLEEP OSCILLATIONS

gender group. Compared between genders, men over the age of 70 had more than a 3-fold deficit in slow wave sleep amount compared with age-matched women. Meta-analyses have replicated this gender-specific difference in slow wave sleep in older age (Ohayon *et al.*, 2004). Interestingly, the moderate reduction in REM sleep time in the oldest participants

(>70 years old) was common to both males and females, suggesting a gender-independent deterioration of this sleep stage.

Gender also impacts age-associated changes in slow wave sleep homeostasis. Older adult men demonstrate significantly less homeostatic slow wave sleep rebound during recovery sleep following sleep deprivation than equivalent-age older women. As with the comparison of basic sleep stages, both elderly men and women show similar homeostatic rebounds in REM sleep during post-deprivation recovery nights (Reynolds *et al.*, 1986). Therefore, gender-dependent and gender-independent effects emerge in older age, further suggesting a model in which some homeostatic mechanisms of sleep remain equivalent and somewhat intact in cognitively normal older adult men and women, such as REM sleep, while others show strong gender-dependent differences, such as slow wave sleep.

Despite gender-specific changes in NREM sleep quantity and quality being more severe in men, a paradoxical and, as yet unexplained, finding is that women are more likely to suffer subjective complaints of poor sleep as they get older, relative to older men (Ohayon *et al.*, 2004). Whether this is due to report bias on the basis of gender, or is explained by an underlying physiological mechanism, remains unclear.

### Sleep medicine and ageing

Sleep Medicine is growing multidisciplinary field within the biomedicine and health. According to the International Classification of Sleep Disorders 3 (ICSD-3), there are about 80 sleep disorders, divided into 6 different clinical divisions: insomnia, sleep-related breathing disorders, central disorders of hypersomnolence, circadian rhythm sleep-wake disorders, parasomnia, sleep-related movement disorders, as well as “other sleep disorders”. Some sleep disorders are strongly associated with specific age and they appear almost exclusively in childhood or in the elderly, but most sleep disorders may appear in all age groups. However, the prevalence is significantly positively associated with ageing. Also, there is a significant negative correlation of sleep duration and sleep quality with age, but the impact of poor sleep quality and sleep disorders on health, healthy ageing and quality of life is not recognized enough, and the public awareness is not at the satisfactory level.

### Sleep disorders in elderly

The number of people in Croatia, as well as in the United States who are 65 years or older is steadily increasing. In Croatia, according to the State Department for Statistics and the Teaching Department for Public Health „Dr. Andrija Štampar“, in 2011 there

were about 17,7% people at 65 years or older and this proportion increased in 2016 to 19,41%.

In the US, proportion of this population is expected to double over the next 25 years to about 72 million. By 2030, roughly 1 in 5 people in this country will be over the age of 65.

Sleep complaints are common among older adults, and as this segment of the population grows, the prevalence of sleep disturbances will also increase. However, sleep problems are not an inherent part of the ageing process (Miner and Kryger, 2017).

There are changes to sleep architecture over the lifespan that are not, in themselves, pathologic, but can be viewed as making older adults more vulnerable to sleep disturbances. It is the consequences of ageing, in the form of medical and psychiatric comorbidity, medication and substance use, psychosocial factors, and primary sleep disorders that put older adults at risk for sleep disturbance. The increasing prevalence of multimorbidity (i.e., having at least 2 concurrent diseases in the same individual) among older adults means that sleep disorders might arise from multiple different domains. Thus, sleep disturbance in this age group should be considered a multifactorial geriatric health condition (previously referred to as a geriatric syndrome), (Miner and Kryger, 2017) requiring consideration of multiple risk factors and a comprehensive treatment approach.

In general, changes to sleep architecture with normal ageing include decreases in total sleep time, sleep efficiency, slow wave sleep, and REM sleep, and an increase in wake after sleep onset. Although sleep disturbance is common with ageing, it is not an inherent part of the ageing process and medical, psychiatric, and psychosocial factors overshadow age as risk factors. There are numerous studies confirming that sleep disturbance in older adults is associated with increased morbidity and mortality and the evaluation and management of sleep disturbances in older adults is best approached as a multifactorial geriatric health condition, arising from impairments in multiple domains.

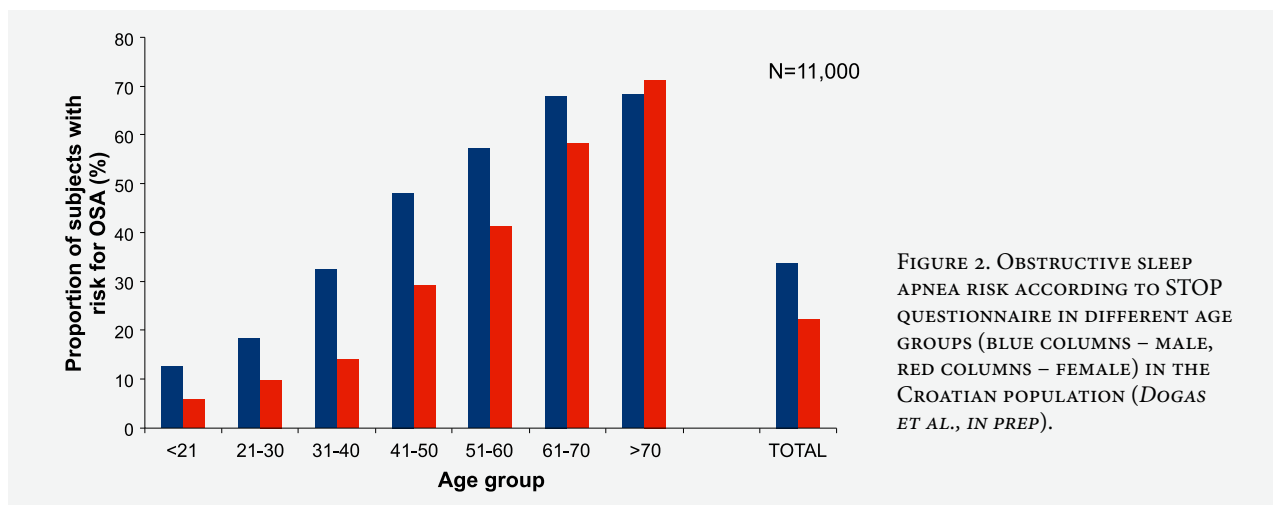
The most prevalent sleep disorders of today, such as insomnia or sleep-related breathing disorders, among which, Obstructive Sleep Apnea (OSA) is the most prevalent and important one, are strongly positively associated with age and make one of the most important risk factors for diminished quality of life, as well as increased morbidity and mortality of the most prevalent diseases in general population, such as cardiovascular and glucose metabolism disorders, but also cancer, which has been published in many recent studies. Also, cognitive and psychomotor impairments are facilitated in the elderly in the presence of sleep disorders.

Increasing public awareness, improving and expanding diagnostic and treatment capacities for sleep

disorders, as well as education of sleep medicine experts, which was recently developed in the Republic of Croatia according to European guidelines, are the primary goals of up-to-date sleep medicine, one of the most prosperous medical discipline, which is going to be even more important in the future due to increased longevity in general population and strong links of sleep medicine and ageing.

### Obstructive sleep apnea

Obstructive sleep apnea (OSA) increases with advancing age, with prevalence estimates differing depending on the definition used. Using a definition of 10 or more apneas and/or hypopneas per hour of sleep, OSA prevalence estimates in older adults may be as high as 70% in men and 56% in women. This is in contrast to prevalence estimates in the general adult population of 15% in men and 5% in women. While it is more common, this condition frequently goes undiagnosed because the phenotype of OSA can look very different in older adults. After the age of 60, the prevalence of OSA is equivalent in males and females, obesity is no longer a significant risk factor, and witnessed apneas and snoring are not as frequently reported. Older adults are also more likely to present with more sleep-related complaints, including daytime sleepiness and nocturia. Older adults are at risk for OSA for several reasons. With aging there is loss of tissue elasticity as well as sarcopenic muscle wasting. There are also structural changes to the upper airway, including lengthening of soft palate and upper airway fat pad deposition. These age-related changes increase the tendency for oropharyngeal collapse. In addition, ventilatory control instability may predispose older adults to apneic events. The negative consequences of OSA in older adults include excessive daytime sleepiness, decreased quality of life, neurocognitive impairment, nocturia, and worsening of cardiovascular disease, particularly hypertension, heart failure and stroke. Diabetes mellitus and depression have also been found to be more common in older adults with OSA. The impact of untreated OSA in older adults on mortality is not clear. However, older adults have similar adherence rates to treatment, so there is no clear reason not to treat older adults with OSA. Recently there was a report of estimated risk for OSA in the Croatian population published using the standardized international questionnaire named STOP (S-noring, T-iredness, Observed apneas, elevated blood P-ressure), which was validated in Croatian language and proved to have high sensitivity and a reasonable specificity for detecting people at risk for OSA (Dogas *et al.*, 2018). In this report, on a rather large sample of almost 11,000 respondents, there were high proportions of people at risk with strong and highly significant positive associ-



ation with age (Figure 2). Also, men were at significantly higher risk than women until elderly, where the numbers were similar.

### Sleep and ageing during the COVID-19 pandemics

**Poor sleep is a risk factor for mental health, well-being and susceptibility for infective diseases such as COVID-19 especially considering the crisis measures such as quarantine**

Long-term home confinement due to an unprecedented global viral outbreak by COVID-19 of vague duration entails increased levels of stress and anxiety, disruption of established daytime and nighttime routines, as well as working schedules, causing deterioration of positive associations between home, relaxation and sleep (Altena *et al.*, 2020). Given the commonness of stress-related sleep problems with possible adverse health consequences and the well-known bidirectional relation between emotional and behavioral reactivity and sleep quality, sleep disturbances during quarantine may become an important issue for everyone. Furthermore, misalignment between behavioral and environmental cycles and environmental setting changes during isolation, including limited beneficial effects of natural daytime light exposure and artificial light suppression of the regular circadian rhythm, may impair circadian system organization and significantly influence sleep patterns, resulting together in an array of metabolic abnormalities (Altena *et al.*, 2020). The rising pervasiveness of circadian rhythm and sleep disruptions during home confinement with increasing evidence of detrimental effects on health, emphasizes the importance of circadian system function and addressing sleep disturbances.

Sleep has been well-recognized as a marker of mental health, especially in the elderly. Sleep problems

were observed in most mental disorders and it has been proposed that sleep disturbances imply an arousal system imbalance likely representing a basic dimension of mental health, with polysomnographic findings possibly playing a key role in psychiatric comorbidity processes. Also, it has been well established even in non-clinical populations that sleep quality is associated with mental health problems such as depression, anxiety and stress. Considering that elderly population is at particular risk for sleep disorders and mental health problems, the proposed association is of specific relevance in this population. Association of sleep and mental health has been extensively reported in elderly females, even after controlling for risk factors common to both. In addition, mental health is associated with physical health issues including general health status, activity limitations, and chronic health conditions in elderly females. The clinical and epidemiologic evidence on the relationship between sleep and physical and mental outcomes highlight the relevance of screening sleep issues in the general population, and especially in vulnerable groups such as the elderly, those with multiple chronic diseases, such as sleep breathing disorders patients with cardiovascular and glucose metabolism comorbidities, but also students as a particularly sensitive group due to their specific sleep habits and risky environment such as quarantine and ongoing online education process.

### Vulnerable population groups in COVID-19 pandemics

Present data point to the fact that COVID-19 infection is particularly serious in some population groups. Thus far, there is an international consensus that vulnerable populations for COVID-19 may include anyone who is an older adult (65 years of age or older), anyone at risk due to an underlying medical condition

(such as cardiovascular disease, hypertension, diabetes, chronic respiratory diseases, cancer), anyone at risk due to a compromised immune system from a medical condition or treatment and anyone with severe obesity (BMI>40) (ECDC-Coronavirus disease 2019 (COVID-19) in the EU/EEA and the UK – eighth update; WHO-Coronavirus disease 2019 (COVID-19) Situation Report-51). At present, there is no data that sleep-disordered breathing (especially Obstructive Sleep Apnea, OSA) increases the risk for contracting or developing more severe forms and outcomes of COVID-19. However, OSA is a condition characterized by many comorbidities including cardiovascular diseases, metabolic diseases (especially diabetes mellitus type 2; see Table 1 and Figure 3 for illustration of this overlap in the Croatian population; Dogas *et al.*, 2018) and respiratory diseases (Bonsignore *et al.*, 2019), all of which put the individual at a higher risk of COVID-19. Although it is considered a sleep disorder, OSA is also included in the International Classification of Diseases list as a chronic respiratory disease (ICD-11, WHO). In OSA, the respiratory function is severely modified such that the episodes of partial or complete airway obstructions affect normal breathing patterns and gas exchange. Additionally, OSA is also more common in the older population (Young *et al.*, 2004), therefore it can be viewed as a superimposing factor to the initial risk stated for this specific population. Finally, another risk factor for COVID-19 is obesity and obese patients have been shown to have a higher incidence of OSA (Malhotra *et al.*, 2002; Young *et al.*, 2004), but are also more prone to developing other chronic diseases, especially the ones affecting the immune system. Having all of this in mind, this could make the individuals suffering from sleep-related breathing disorders more susceptible to viral pneumonia-like diseases, such as COVID-19. Considering the high prevalence of sleep-disordered breathing, which is estimated in recent studies to be up to 25–50% in the adult population, it is of major interest to assess the risk, prevalence and the outcomes of the COVID-19 disease caused by novel coronavirus SARS-CoV-2 in this population.

### OSA patients as a vulnerable group particularly sensitive to COVID-19

So far there is no data that OSA by itself increases risk of infection. For most OSA patients, a reduction in their quality of life is due to symptoms such as poor sleep quality, excessive daytime somnolence, and fatigue with differences between gender, ages and nations. Also, because of the known comorbidities such as hypertension, diabetes and obesity OSA patients are at higher risk in all age groups, especially in elderly, but also in many cases where OSA was not recognized

and diagnosed before the COVID-19 infection. Also OSA patients might be more likely to develop complications of COVID-19 than other individuals because of an already compromised upper airway system, repetitive episodes of hypoxia and hypercapnia during the night, and also immune system. Therefore we might speculate whether OSA promotes negative outcomes and more complications in patients diagnosed with COVID-19 especially if they have been diagnosed with comorbidities such as arterial hypertension, diabetes mellitus and obesity.

In patients who are diagnosed with moderate to severe OSA, a continuous positive airway pressure (CPAP) device is a gold standard therapy and should be used permanently during sleep because without treatment, exacerbation of the disease will also include further weakening of the immune system, which make them more susceptible for infection. Precaution should be advised for patients who are at home in quarantine and regularly use CPAP devices. Usage of CPAP could spread the virus through the exhalation port, which allows carbon dioxide to escape from the mask. This port also may release smaller virus-containing particles as an “aerosol,” which can remain suspended in the air for a few hours. However, patients with severe OSA should continue using CPAP while sleeping alone in a separate bedroom. So far, there is no studies showing that using CPAP will cause more severe forms of

TABLE 1. PROPORTION OF SUBJECTS WITH DIABETES MELLITUS TYPE 2 (DM2) IN THE GROUPS OF RESPONDENTS WITH AND WITH NO RISK FOR OSA ACCORDING TO STOP QUESTIONNAIRE IN DIFFERENT AGE GROUPS; NUMBER OF SUBJECTS AND PROPORTIONS IN EACH SUBGROUP (%) ARE SHOWN.

Age group (years)	Total N=10196	No risk for OSA N=4794	With risk for OSA N=5402	$\chi^2$	P*
<21	48/2944 (0.6)	31/2675 (1.2)	17/269 (6.3)	40.59	<0.001
21–30	76/2628 (2.9)	52/2253 (2.3)	24/375 (6.4)	19.17	<0.001
31–40	59/1112 (5.3)	32/858 (3.7)	27/254 (10.6)	18.57	<0.001
41–50	75/1547 (4.9)	30/967 (3.1)	45/580 (7.8)	17.04	<0.001
51–60	157/1479 (10.6)	49/739 (6.6)	108/740 (14.6)	24.72	<0.001
61–70	131/589 (22.2)	35/217 (16.1)	96/372 (25.8)	7.42	0.006
>70	124/555 (22.3)	28/166 (16.9)	96/389 (24.7)	4.09	0.043
Total	670/10854 (6.2)	257/7875 (3.3)	413/2979 (13.9)	419.32	<0.001

\*Chi-squared test

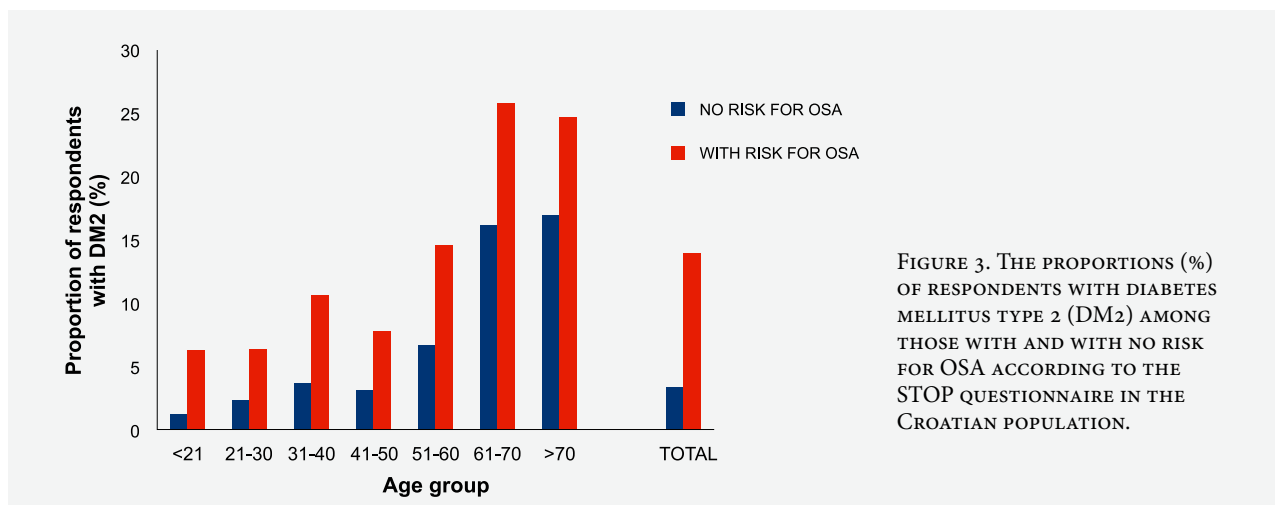


FIGURE 3. THE PROPORTIONS (%) OF RESPONDENTS WITH DIABETES MELLITUS TYPE 2 (DM2) AMONG THOSE WITH AND WITH NO RISK FOR OSA ACCORDING TO THE STOP QUESTIONNAIRE IN THE CROATIAN POPULATION.

COVID-19, but we need more scientific research to provide evidence.

It should be emphasized that due to the lack of evidence on COVID-19 infection severity and outcomes in OSA patients, both those treated at home or in a hospital settings with provided respiratory care (oxygen and/or mechanical ventilation), especially in the vulnerable elderly populations during quarantine, this research question provides an innovative scientific research interest.

### Conclusions

Sleep Medicine is growing multidisciplinary field within the biomedicine and health. The most prevalent sleep disorders of today, such as insomnia or sleep-related breathing disorders are strongly positively associated with age and make one of the most important risk factors for diminished quality of life, as well as increased morbidity and mortality of the most prevalent diseases in general population, such as cardiovascular and glucose metabolism disorders, but also cancer, which has been published in many recent studies. Also, cognitive and psychomotor impairments are facilitated in the elderly in the presence of sleep disorders.

One of the most notable findings regarding sleep in the elderly is the profound increase in inter-individual variability, which thus precludes generalizations such as those made for young adults.

The latest global developments emphasized the fact that poor sleep is a risk factor for mental health, well-being and susceptibility for infective diseases such as COVID-19 especially considering the crisis measures such as quarantine.

At present, there is no data that sleep-disordered breathing (especially OSA) increases the risk for contracting or developing more severe forms and outcomes of COVID-19. However, OSA is a condition

characterized by many comorbidities including cardiovascular diseases, respiratory diseases, metabolic diseases (especially diabetes mellitus type 2) and obesity, all of which put the individual at a higher risk of COVID-19.

Increasing public awareness, improving and expanding diagnostic and treatment capacities for sleep disorders, as well as education of sleep medicine experts, which was recently developed in the Republic of Croatia according to European guidelines, are the primary goals of up-to-date sleep medicine, one of the most prosperous medical discipline, which is going to be even more important in the future due to increased longevity in general population and strong links of sleep medicine and ageing.

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## K-IV

## Confronting the Dementia Pandemic: A World Economic Forum and Global CEO Initiative on Alzheimer's Disease

### Global Partnership to Speed Collaboration and Innovation

George Vradenburg

Convener, The Global CEO Initiative on Alzheimer's Disease

#### Introduction: The Urgent Need for Action

The world is confronting an emerging pandemic with absolutely no preparedness plan – one that threatens to be larger, longer, more devastating, and more costly than COVID-19. The emerging pandemic: the expensive and lengthy chronic diseases of aging, especially dementia. The COVID-19 outbreak illustrates the dire consequences if health systems don't prepare for dementia, which is already devastating older populations and impacting every aspect of society. It comes at a time when caregiving and working-age populations are shrinking, when national fiscal budgets needed to support aging healthcare costs are under stress, and when the monetary policy mechanisms to drive economic growth in the face of a declining global workforce are exhausted. While COVID-19 is the current public health priority, global leaders cannot afford to overlook dementia's immense impacts – today and in the long-term. Already, more than 2.4 million people die from dementia every year, and, in the U.S. alone, cumulative costs of care could exceed \$20 trillion from 2015 to 2050.(1,2) As the next pandemic, dementia is both inexorable and foreseeable.

The world needs a global preparedness plan for dementia. On our current course, global dementia prevalence is projected to triple to 152 million families by 2050, or close to 500 million affected people. In Europe, the number of people 60+ with dementia will grow by roughly 60% to more than 14 million by 2040. (3,4) This surge in prevalence threatens to take an unsustainable toll – upending people's lives and communities, straining healthcare systems, generating immense costs, and draining workforces and economies.

We can change this trajectory. There is a growing consensus about the elements of a dementia preparedness plan: early and systematic testing and detection, a standing global, industrial- strength, trial-ready system for testing new therapies, public health intervention plans to reduce peak prevalence, and a healthcare system ready and able to get the right intervention to

the right patient at the right time in disease progression. Sound familiar? What we largely did not have in place to address COVID-19, we need to put in place to address dementia.

This plan will require overcoming a number of challenges, from basic science to healthcare and public health system preparedness. Researchers need a better understanding of the heterogeneity of the causal pathways of dementia. Differential pathways require biomarker systems that can identify the differential populations for testing differential interventions. Current sporadic clinical testing systems must be built into efficient global trial platforms. Healthcare systems need accessible and affordable diagnostics to identify those at-risk for dementia and deliver precision interventions to the right patient when they need them. Physicians need training, tools, and incentives to provide early, accurate diagnoses. And the public needs the hope and confidence that there is something that can be done to prevent or treat cognitive decline – now.

To address the challenge of developing a global preparedness plan for dementia, the World Economic Forum (WEF) and the Global CEO Initiative on Alzheimer's Disease (CEOi) launched a new, global effort in Davos in January 2020: The Davos Alzheimer's Collaborative (DAC). DAC is premised on the proposition that all nations and all sectors are in this together; that individual governments, as well as inter-governmental organizations, the pharmaceutical and biotech industries, leading researchers, and patient advocates, must come together to develop and execute a consensus preparedness plan.

DAC will link current dementia efforts, scale successful models, and create new initiatives – targeting four key areas:

- Build a targeted global cohort of populations with or at risk of Alzheimer's disease to drive discovery of precision intervention targets by focusing on research with populations that have genetic and genomic diversification.
- Build a clear, coordinated, and comprehensive precision biomarker development process to accompany the development of new precision targets.
- Create a global platform to support global clinical trials capable of bringing new drugs to market at a faster rate.
- Drive healthcare system preparedness to improve early detection and diagnosis, diagnostic and treatment delivery infrastructure, and patient affordability of treatments.

We believe these steps are essential to making faster progress toward the discovery, testing, and delivery of precision interventions for dementia – and we believe Europe can and should take the lead. On behalf of DAC's leadership and members, we look forward to

discussing this urgent issue with European policymakers, exploring opportunities for collaboration, and deepening our shared commitment to speeding dementia innovation and preparedness.

### Challenge: Global Population Aging and the Growing Impacts of Dementia

Rapid population aging presents a number of pressing challenges for every nation, for global economic growth, and for families around the world. Scientific and medical advances have brought us unprecedented longevity, raising average global life expectancy by more than 30 years in the past century.<sup>(5)</sup> There are now roughly one billion people over the age of 60 globally, and this number is projected to increase to 2 billion by mid-century.<sup>(6)</sup> Europe is at the forefront of this trend: there were more than 100 million people over the age of 65 in the EU-28 in 2018, or 20% of the population, and these numbers are projected to increase to 149 million older people, or 29% of the population, by 2050.<sup>(7)</sup>

While today's aging and longevity are a modern miracle, they will also dramatically increase the burden of age-related health conditions. We are not prepared for this emerging pandemic, and dementia is the epicenter of the looming crisis. More than 50 million people live with dementia globally; projected to increase to 152 million by 2050.<sup>(8)</sup> Europe is on the frontlines due its aging population. The number of people 60+ with dementia in the EU increased from 5.9 million in 2000 to 9.1 million in 2018, and, if current prevalence rates continue, this total is projected to grow by roughly 60% to 14.3 million in 2040.<sup>(9)</sup>

Without an urgent and coordinated response, this dramatic rise in prevalence will generate tremendous impacts on people, families, communities, and national healthcare systems, as well as on economic growth, workforce size and participation rates, and fiscal and monetary policy. Dementia is already the fifth leading cause of death worldwide, and, as of this paper, the only one of the top ten leading causes of death for which there is no truly effective treatment or cure.<sup>(10)</sup> The condition is responsible for roughly \$1 trillion in annual costs, and this total is projected to double by 2030.<sup>(11)</sup> Dementia also takes an enormous toll on families, who often provide unpaid, informal care for years or decades.

Now is the time for leaders to join together, across sectors and national boundaries, to take immediate, sustained, innovative action to develop and execute a dementia preparedness plan. We must accelerate research progress to improve our understanding of dementia and develop precision therapies and accompanying biomarkers, while also drastically improving healthcare systems' preparedness to effectively differ-

entially diagnose dementia and deliver precision therapeutics as they become available.

### Context:

#### The State of Dementia Science and Policy

There is a growing consensus that meaningful therapeutic progress against dementia will require “shifting the science to the left” – understanding, detecting, diagnosing, and treating the condition in its earliest stages, including even before symptoms arise. This early intervention appears to be necessary for disease-modifying therapies to maximize their effects over a long period, as indicated by promising recent clinical trial results for aducanumab and BAN 2401.(12,13) Therefore, “shifting to the left” offers a potential breakthrough in an area where a new therapy has not been approved in the U.S. or Europe since 2003, and where more than 99% of clinical trials have not advanced to regulatory approval – the lowest for any therapeutic area.(14,15)

At the same time, there is also a growing scientific consensus that the causes and course of dementia varies from individual to individual based on individual genetic, biological, and phenotypical variability and heterogeneity. This means that more diverse cohorts of individuals must be investigated to identify the “clusters” of populations with sufficiently similar characteristics that can be treated with the same intervention. That variability, in turn, requires accompanying biomarkers or biomarker “clusters” to stratify populations for clinical research studies and for clinical diagnostics, so that the healthcare system can “match” precision medicines to different subpopulations with or at risk of dementia.

As effective therapies are developed, regulators and payers will need to develop innovative methods to approve and reimburse for treatments that may slow, but not stop, disease progression and that may not show health system cost savings for years or decades – challenging current regulatory and payment models. Healthcare systems will need to improve rates of early detection and diagnosis, better characterize patient populations and people at-risk, and ensure necessary infrastructure to diagnose and deliver treatments. Additionally, many dementia patients have one or more comorbid chronic conditions, further complicating efforts to understand the disease, characterize patient populations, provide appropriate therapies, and measure the economic and health benefits of treatment.

Despite these challenges, growing momentum among policymakers, the private sector, international organizations, and dementia advocacy organizations points a way forward – and Europe can play a leadership role in developing a transnational dementia pandemic preparedness plan. Europe has already led his-

toric efforts to address dementia, including the first national dementia plan in France in 2001 and the United Kingdom’s focus on dementia at the meeting of G8 Health Ministers in 2013.(16,17) Today, global leaders are stepping up their focus on dementia, as this topic was on center stage at the World Economic Forum in 2020 and spotlighted at the 2019 meeting of the G20 in Japan.(18)

These efforts provide hope, especially in light of recent positive clinical trial results, a promising pipeline of new therapies, and a number of innovative dementia initiatives in countries around the globe. Leading governments, companies, and international organizations are better positioned than ever before to change the trajectory of dementia and elevate dementia preparedness on the global agenda. We cannot leave the lessons of COVID-19 unlearned as we confront the slow-burn pandemic of dementia.

#### The Global Initiative: The Collaboration to Speed Alzheimer’s Innovation

In January 2020, the World Economic Forum (WEF) and the Global CEO Initiative on Alzheimer’s Disease (CEOi), launched the Davos Alzheimer’s Collaborative (DAC), a multi-stakeholder, pre-competitive coalition designed to drive global scientific, business, policy, and financial coordination in dementia preparedness.

DAC will build a coordinated strategy to link, scale, or initiate actions to diversify, accelerate, and deepen dementia preparedness efforts. Our long-term vision is to create a highly prioritized, well-resourced global Alzheimer’s research environment with an efficient path to market, supported by an engaged healthcare system.

DAC is uniquely positioned to achieve this vision because of members’ recognized global leadership, deep expertise, significant resources, and long-standing commitment. Members include leading governments, the leading and largest biopharmaceutical companies working in the dementia space, top international organizations, and influential organizations from the philanthropic sector. In addition, DAC is conducting ongoing discussions with a number of national governments to lead the policy element of the collaboration – including the United States, the Netherlands, Japan, and Brazil – and we are eager to explore collaboration with other governments.

The leadership and members of DAC recognize that there are a wide range of important dementia efforts already underway around the globe. Therefore, DAC will embrace a “link, scale, create” approach – linking together relevant efforts to maximize their impact, identifying and scaling the best existing models, and creating new initiatives when no relevant efforts al-

ready exist. We believe this approach will enable greater efficiency and faster results.

Based on discussions with leaders and experts, DAC will target four key opportunities for innovation in dementia: global cohort development; biomarker development; global clinical trials; and healthcare system readiness. We believe these four pillars offer the greatest promise to solve existing challenges in the space and catalyze rapid progress that makes a meaningful difference for people living with or at risk for dementia.

**1. Build a targeted global cohort of populations with or at risk of Alzheimer's disease to drive discovery of precision intervention targets by focusing on research with populations that have genetic and genomic diversification.**

Progress against dementia requires a comprehensive, nuanced understanding of the condition. However, at the present time, researchers do not fully understand the disease's heterogeneity. This lack of understanding limits the ability to identify new targets for drug development, as well as to execute precision medicine approaches to dementia.

DAC aims to address this challenge by creating a large prospective cohort – ideally, including 1 million people or more – with standardized approaches to deep biotyping and phenotyping. This effort will include the creation of Centers of Excellence to serve as pilot sites and leaders on innovation. To create the cohort, DAC will explore how to link relevant efforts that are already underway.

**2. Build a clear, coordinated, and comprehensive precision biomarker development process to accompany the development of new precision targets.**

New targets for therapeutic interventions and precision medicine approaches require validated, standardized biomarkers and diagnostics to improve early detection and diagnosis, identify people for select treatment, and better measure the efficacy of new therapies. However, existing biomarker development efforts are largely siloed, and biomarker data is rarely reproducible. Further, there is no clear pathway for the private sector to validate or qualify biomarkers, and there are limited commercial incentives to invest in this area.

DAC aims to address this challenge by building a clear pre-competitive pathway for the identification, standardization, validation, and reproducibility for biomarker development. The platform will standardize data sharing for biomarkers and enable the sharing of biological samples, thereby speeding research and treatment delivery. The platform will also align stakeholders on high-value biomarkers and testing through current and future trials, further accelerating development.

**3. Create a global platform to support global clinical trials capable of bringing new drugs to market at a faster rate.**

Progress against dementia requires faster and less costly clinical trials, thereby accelerating the development of new therapies and attracting research investment. However, clinical trials are currently slow, laborious, and expensive, often requiring years of effort from researchers, trial participants, and care partners, as well as immense investments from biopharmaceutical companies.

DAC aims to address this challenge by creating a global clinical trial support infrastructure. This will include a standing, trial-ready platform and an integrated network of high-performing institutional and private trial sites. The effort will also develop the capacity for adaptive and combination trials. These initiatives, together, will accelerate the delivery of new, more diverse therapies to market at greater speed and lower cost.

**4. Drive healthcare system preparedness to improve early detection and diagnosis, diagnostic and treatment delivery infrastructure, and patient affordability of treatments.**

DAC will engage national healthcare systems to improve their preparedness for new Alzheimer's therapies, focusing on increasing testing and diagnosis, expanding the availability of healthcare infrastructure and capacity, and ensuring access when new treatments become available.

Progress against dementia requires dramatically **improving rates of early, accurate testing, detection, and diagnosis**. Currently, testing, detection, and diagnosis is often late, slow, or inaccurate, if it's made at all. Indeed, 50% of patients with any form of dementia are not formally diagnosed, and, when diagnosis is made, it's delayed by an average of 2–3 years after the onset of symptoms.(19,20) Further, 25% of patients clinically diagnosed with probable Alzheimer's disease during their lifetime are found not to have Alzheimer's pathology at autopsy – raising questions about the accuracy of diagnosis.(21) There are a number of causes for these diagnostic challenges: providers lack sufficient training; the public is not educated about brain health, and patients rarely raise symptoms with providers; and there is a lack of simple, effective, and inexpensive diagnostics.

DAC aims to address this challenge through efforts to train physicians, educate the public, and spur the creation of diagnostics. DAC will increase the number of healthcare providers who are trained to detect and diagnose dementia and Alzheimer's, as well as prioritize brain health and dementia prevention with the public and healthcare systems. DAC will also catalyze innovation in diagnostics and provide access to those diagnostics.

Progress against dementia requires **healthcare infrastructure** to effectively and efficiently test for the condition and provide appropriate treatment. However, healthcare systems currently lack critical infrastructure for imaging, fluid, and genetic testing, infusion sites for treatment, and sufficient training of the healthcare workforce. For example, genetic testing is not available in Germany, and Italy only provides reimbursement for infusion in a hospital by a specialist. (22) The introduction of new treatments will place greater pressure on these gaps.

DAC aims to address this challenge by improving access to existing infrastructure and creating additional system capacity. Working with national governments and healthcare systems, DAC may support the development of a “treatment-ready” population, drive access and acceptance of cerebrospinal fluid testing, and address access barriers for existing infrastructure.

Progress against dementia requires **sufficient access to treatment** for new therapies that enter the market. However, payers are concerned that new dementia therapies will require high upfront costs, but without clear evidence, available when they enter the market, about whether and when a treatment will reduce downstream costs, improve health outcomes, and provide value. These concerns are particularly pressing for therapies that will need to be administered in pre-symptomatic or early-stage patients for a number of years.

DAC aims to address this challenge by increasing patient access, while reducing the risk to payers. Specifically, DAC will support innovative payment models and catalyze a post-approval platform to capture data on costs and outcomes in heterogeneous populations. DAC will also support reimbursement for diagnostic testing and the availability of approved fluid diagnostic tools.

### The Path Forward: Building Cross-Sector Collaboration and Leadership for Dementia Innovation

Global leaders must prioritize dementia innovation, if we are to build a healthy, prosperous, and productive future. While past dementia efforts have delivered important results, there is a pressing need to dramatically accelerate the pace and scale of global cross-sector collaboration, leadership, and innovation. This is the only way to achieve the advances that can make a meaningful difference for communities, societies, and economies, as populations age in Europe and around the world.

DAC is eager to explore collaboration with European governments to achieve this vision. National governments will play a critical role as members of DAC by providing policy and financial support, co-convening stakeholders, and prioritizing and crafting innova-

tive dementia preparedness systems within their countries.

Together, we can seize the most important opportunities for innovation and change the course of dementia in our aging world.

*For more information and to join our effort:*

Please contact Drew Holzapfel, Executive Director, The Global CEO Initiative on Alzheimer's Disease at [dholzapfel@highlanterngroup.com](mailto:dholzapfel@highlanterngroup.com) or +1.703.599.9617.

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## K-V

# Dying Young, as Old as Possible: Public Health Challenges for Healthcare Systems in Ageing Societies

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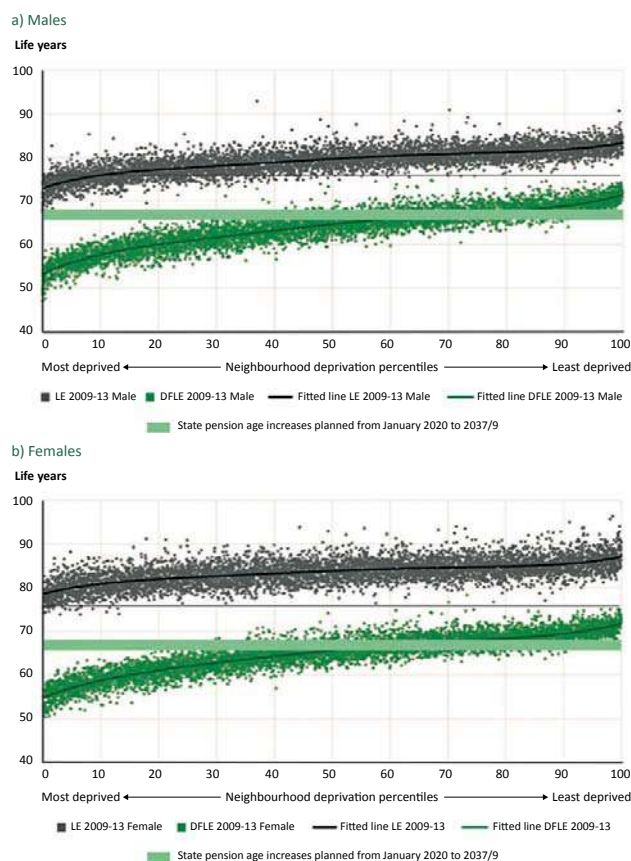
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Immediate Past President, United Kingdom Faculty of Public Health Sir Richard Doll said he wanted 'to die young as old as possible'. In his vision, the chance for more people to live to the Biblical 70 years was made greater by his discovery of cigarette smoking killing people prematurely, from lung cancer and heart disease and the opportunity presented to prevent all these diseases, by education. There was a post Second World War and post antibiotic revolution chimera, that infectious disease had been conquered and now we would apply all our efforts to the epidemics of non-communicable disease. We would eradicate these too by rational investigation and removal of risks.

The reality in the United Kingdom, and perhaps for most countries is that this ideal is not being delivered. For many '70 maybe the new 50' but the benefits in improving life expectancy are not being experienced equally, within countries, or between countries and continents. Life expectancy may have been improving greatly in many countries. Healthy life expectancy is improving less, and inequalities in healthy life expectancy are widening. Sir Michael Marmot's graph of life expectancy and healthy life expectancy in over 200



FIGURE 1.



Source: Office for National Statistics (ONS) and Department for Work and Pensions (14) (15) (16)  
Note: Each dot represents life expectancy (LE) or disability-free life expectancy (DFLE) of a neighbourhood (middle level super output area)

FIGURE 2. LIFE EXPECTANCY AT BIRTH BY NEIGHBOURHOOD DEPRIVATION PERCENTILES, 2009–13, ENGLAND

neighbourhoods of England shows a gap of over 10 years in life expectancy, but a gap of over 20 years in healthy life expectancy. This gap represents the time a person will live with one or more long term conditions. (1)

I used to be Director of Public Health in Sandwell in the post-industrial West Midlands of England. There, a poor working-class man in West Bromwich may think it is normal to have chest pain at 45, or to be breathless climbing a flight of stairs. Many more will live with the daily diet and treatment rituals of obesity-induced type 2 diabetes. Obesity is the norm in the West Midlands, with over two thirds of the adult population obese or overweight. Lifetimes of poor and insecure employment, poor education opportunities and life without hope, leave people prone to the ravages of multinational companies peddling highly processed high-fat high-sugar foods, alcohol, tobacco and gambling. The multi-national companies employed the 'merchants of doubt' to question Sir Richard's rational evidence of tobacco as the cause of lung cancer. The 'Big' purveyors of non-communicable disease, Big Food, Big Tobacco, Big Alcohol, Big Gambling, Big Fossil fuel, have all adopted their merchants of doubt,

are still alive and thriving on human misery. Years of austerity since the 2008 financial crash, have seen a double assault on the health and livelihoods of people in the poorer areas of the United Kingdom. Health has been directly damaged, with the resultant diseases of despair- alcoholism, addictions, poor mental health and suicide, accidents and violence. Alongside this the services many have come to rely on to help them in these times of need, have been cruelly and cynically cut. I reviewed the extent of the damage to United Kingdom public health in my President's valedictory address to the members of the United Kingdom Faculty of Public Health in June 2019. (<https://better-healthforall.org/2019/07/30/past-presidents-end-of-term-report-part-2-the-health-of-the-public/>) It has also been graphically set out by Marmot and colleagues this year. (1)

A public health approach to healthy ageing requires good data to describe the position of older people are living in and to propose solutions and evaluate interventions. It requires thorough knowledge of the major causes of ill health, dependency and inequality- in poor housing, inadequate income, environmental problems, poor and unrewarding work and poor chances for a fulfilling life and leisure, unsatisfactory family and social support networks. And it requires healthy public policy interventions to address these.

A public health approach requires improvement of environments in which older people live- involving town planners and engineers in moves towards 'dementia friendly cities', and 'accessible cities', and for communities which enable active travel and participation throughout life. Strong community involvement is required, and inter-generational activities. Citizen-led activities to promote healthier ageing are vital; a central tenet of health promotion is that health and care needs cannot be met solely through expert and professional provision- most care is delivered by family and community carers, so too must preventive interventions. Across the social divide, people live increasingly sedentary leading older people to become frail and dependent before their time. Resources developed by Sir Muir Gray in the United Kingdom seek to help people stay active, physically and mentally, as they get older, developing the concept of "optimal ageing" <https://www.livelongerbetter.net>. Individuals can be given the tools for personal support and for maintaining their own health- support from peers, self help groups, 'expert patients' can be important in helping people to maintain their independence and assert their personalities and their dignity and respect as human beings. Social prescribing has come into vogue- health professionals able to 'prescribe' a fitness class or a cooking class. This risk professionalising everyday activities, but it also enables prescriptions to be for more appropriate care. Many schemes recognise the need

for housing repairs on prescription and welfare rights, rather than just 'lifestyle' prescriptions. Some of the tools for personal support are in the fields of new technology. Video conferencing has been propelled to routine and everyday by the current pandemic. Older people who may not have been computer literate are picking up the controls. Micro-technologies also enable more activities of daily living to be supported; the costs of mass production and modular production for aids and adaptations is coming down and enabling more people with disabilities, to not be handicapped, and so remain independent.

And we need health and social care services which are reoriented towards effective interventions, and which are responsive to personal needs. Within health systems, public health approaches are important – some of these can be considered the 'epidemiology of health care'. 'Value-based health' also as advocated by Muir Gray, and as presented in a European Union report last year (2), require all working in public health and health care to re-evaluate effective health service interventions and eliminate wasteful practices and the least effective clinical and care measures. The OECD report on "Wasteful Spending in Health" (2017) presented alarming data on inappropriate care and wasted resources with estimations ranging from a conservative 10% up to 34% of expenditures. Less wasteful care can reduce costs, but also reduce health harms, iatrogenic disease including side effects of medications, hospital acquired infections and blood clotting disorders, acute anxiety and disorientation, and so on. Appropriate care requires much more active involvement of individual patients and their carers. Less intervention may be better care. 'Adding life to years' becomes more important than merely 'adding years to life'. Quality of life becomes of paramount importance. But even where high technology and heroic intervention is justified, patients, carers and families, must be informed and be able to play an active part in the decision making, in what has come to be called 'the co-production of health'. Even in end of life care, a public health approach, as exemplified by the compassionate communities model, is important; as advocated by Professor Alan Kellahear, death cannot be professionalised and managed exclusively by health and care services; families and communities are the most affected and need to be given the tools and resources to be confident in talking about death and being supportive for people in the last period of life, and those around them.

All of these areas of intervention require a public health system and public health professionals to be inclusive and working in partnership, with health and care services, but also with many other agencies, communities and disciplines. The public health professional does not have exclusive and comprehensive knowledge of everything that can be done to protect and improve the health of the public. We need to under-

stand other languages- and speak them well enough- town planner, transport manager, housing specialist, economist, educationist, communications expert, community activist, public policy analyst and increasingly, we need to add climate scientist, ecologist, theologian, international lawyer and political scientist. All of these and more are vital to the health of the people and planet (3)

And we need to embrace law, ethics, rights and values. We need to reaffirm our values. We need to restate our belief in equality, in the rights of individuals to health and to access to health and social care which is universally available. We must value all individuals equally. We must avoid drifting into the uncaring sentiments, which do not value or recognise the rights and autonomy or even become a cynical expression of political philosophy, such some have expressed in the current COVID-19 pandemic. 'It's only killing the elderly', or, 'those with underlying conditions'; invoking herd immunity in which some will 'taking it one chin' for others to survive.

The COVID-19 pandemic has highlighted weaknesses in my country, of social care, which is run by private companies and individuals, which is unplanned, unresilient, and dependent on an army of over 1.5 million low paid care workers who are mainly from European Union countries and minority ethnic groups. Some English local health organisations have been reluctant to support privately run care homes with NHS expertise, in such crucial areas as infection control, medicines management, falls prevention and tissue viability and pressure sores prevention. There is a growing call for a national health and social care system in England. Other countries may face similar problems- while others, notably Scandinavian countries, have organised older persons care more securely.

There is clearly much to be done, in our respective countries, and internationally, to ensure we all have the maximum opportunity to live fulfilling lives, free of ill health for as long as possible, and protected by safety net coverage of health and care services when we need them. The COVID-19 pandemic has uncovered weaknesses in services in some countries and offered glimpses of how health might be improved for the future. Beyond COVID-19, we will need to redouble our efforts to prevent climate breakdown, address major health damaging trade problems, curb the obscene powers of multinational corporations which damage our health and address global problems of intolerance, epidemic resort to violence and organised armed conflict.

There is an emergency planning cliché, that 'we should hope for the best and plan for the worst'. The best we should hope for, is to die young as old as possible, in a peaceful, more equal world, but we should plan for the worst- develop our health and care systems and our preventive services, to make our hope a reality.

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## K-VI

### Biomedical Engineering, Artificial Intelligence and Internet of Things for Healthy Ageing

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Applied Biomedical Signal Processing and Intelligent eHealth Lab,  
University of Warwick, UK

In 2014, the World Health Organization (WHO) stated that more '*trained and qualified biomedical engineering professionals are required to design, evaluate, regulate, maintain and manage Medical Devices, and train on their safe use in health systems around the world*'. In 2015, the European Institutions engaged in a wide discussion with the European (i.e., European Alliance for Medical and Biological Engineering and Science, EAMBES) and the global (i.e., The International Federation of Medical and Biological Engineering, IFMBE) community of biomedical engineering (BME) practitioners and scholars. The results of this discussion resulted in a report published in the European Journal in April 2015 (2015/C 291/07) stating that '*Biomedical Engineering is not simply a subset of modern medicine. Modern medicine predominantly secures important advances through the use of the products of biomedical engineering*'. In 2018, the European Commission included for the first time "Biomedical Engineering" in the European Skills, Competences, Qualifications and Occupations (ESCO) database.

This growing attention is probably due to the dizzying growth of the main *product of biomedical engineering*: medical devices. In fact, Europe is leading the growth of the medical device sector, accounting for the 30% of the global market, employing about 1 million

of workers in this area and leading by large the innovation in this field (e.g., number of papers, patents and research grants in this area). The market of medical devices will probably become one of the main drivers of the EU economy over the next years. A proxy for this forecast is the number of patent applications submitted per year. In fact, while the yearly number of patent applications per pharma and biotechnologies is still doing very well (about 6,000 novel patent applications per year), the number of patents for medical technologies is doing twice better, with over 12,000 novel patent applications in 2016 (1).

The fast evolution and diffusion of available and affordable medical devices is contributing to shape the future of medicine focus and practice. In fact, medicine is going to be more focused towards the wellbeing (not just health) of citizens, focusing more and more on primary prevention and lifestyle management. After hundreds of years, medical practice is expanding the remit of medical care from hospitals towards the monitoring and correction of citizens' health trajectories in real-life.

The fast development of artificial intelligence (AI), internet of things (IoT), telecommunications (e.g., 5G) and the convergence of these technologies into the medical device domain is offering novel and unprecedented opportunities to collect and use huge amount of data (a.k.a., big-data) for advancing medical knowl-

edge and improving patient management, especially in later life.

In this fascinating scenario, this talk will illustrate how AI, IoT and big-data are going to be used in the forthcoming years in order to make healthcare interventions more affordable, sustainable, effective and safe.

This talk will present a series of pilot studies in which these innovative technologies are used for fostering active and healthy ageing and to improve the prevention, diagnosis, treatment and management of chronic conditions.

Finally, this keynote will rise the attention on current gaps, which are hindering the adoption of these promising technologies in everyday clinical practice and citizen life, and what policy-makers can do, in order to foster this unprecedented opportunity to improve the quality of life and the independency of senior citizens. Among other challenges, policy-makers will have to drive the change towards the adoption of novel assessment and reimbursement strategies for technologies improving primary prevention.

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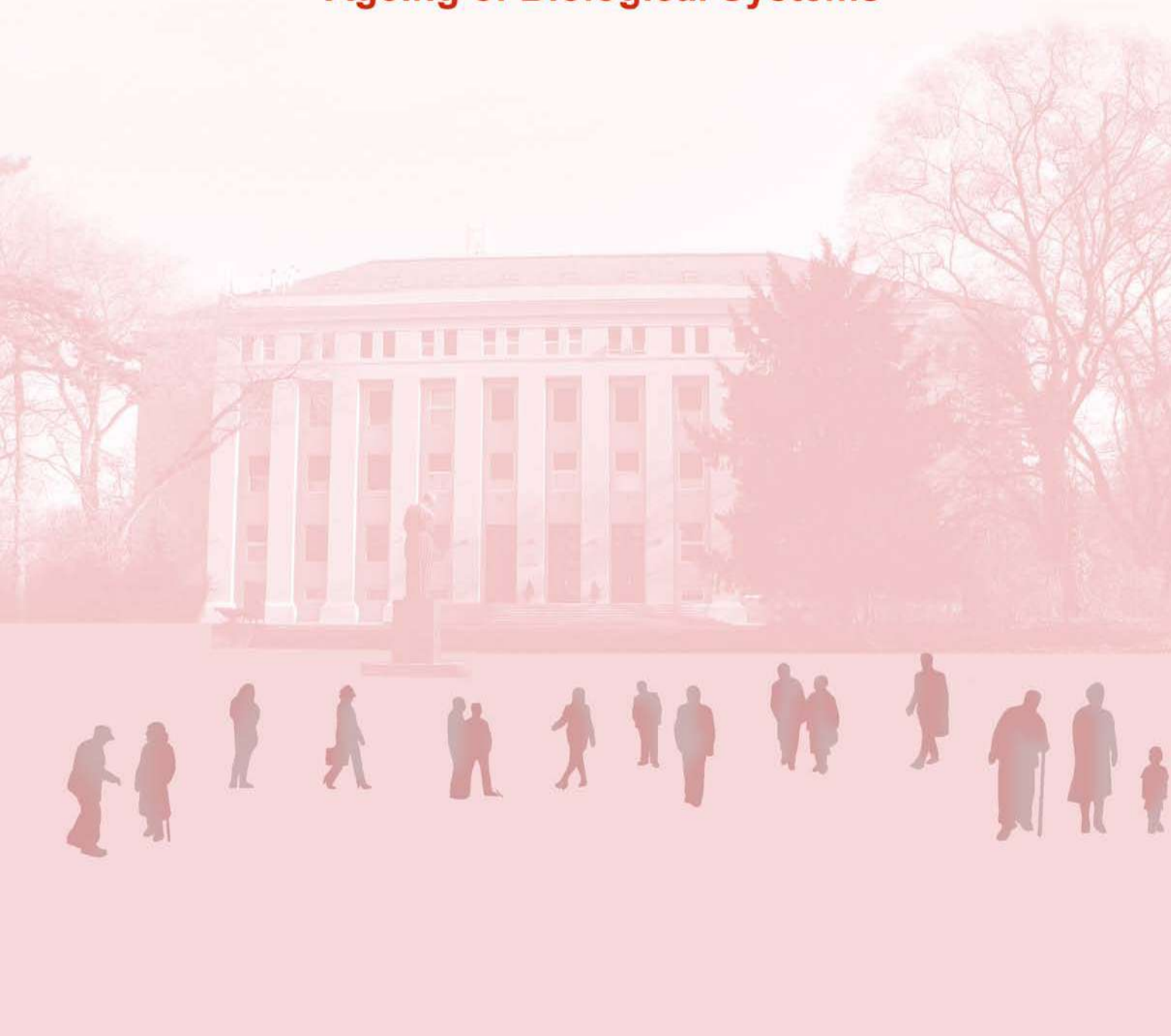


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**BETTER FUTURE of HEALTHY AGEING 2020**

Theme A  
**Ageing of Biological Systems**





## Session A1: Changing Pathology of Ageing Society

## Invited lecture

## A1-I

## Evolving Needs in Pathology Education

Ambrogio Fassina

Dpt of Medicine, Section of Pathology, University of Padova, Italy

History of medicine is evidently and strongly connected with the history of human thinking, connection and collaboration with other sciences such physics and chemistry. Pathology as well was and is dependent and involved in technology evolution from its very beginning (Table 1).

TABLE 1

1591	compound microscope
1673	Anton van Leeuwenhoek simple microscopes with single lenses
1848	first microtome (for animal tissues)
1885	Cambridge Rocker microtome
1886	minot microtome
1910	sledge microtomes
mid1800s	paraffin wax for infiltration and support clocks
1893	first use of formalin
	staining hematoxylin and eosin
	silver impregnation

Last century approach is basically still in use for nowadays routine diagnostic, with significant changes in time and quality, but slide preparation for surgical pathology is still artisanal and human dependent. In the sixties of last century, biology introduced the protein purification and the development of antibodies against antigens of cell component, and immunohistochemistry changed the diagnostic perspective, bringing pathology in the real circuit of medical decision about prognosis and therapy. More recently, biology, physics, statistics and chemistry introduced new tools in the approach to human tissues that again obliged to move to different requests from clinicians and a different expertise of pathologists.

In the meanwhile, the pathology laboratories grew in terms of manpower number and expertise of the technical personnel and in terms of machinery, both for sample handling and preparation and for preanalytical, analytical control and finally for Informatics for communication to colleagues and patients.

Medical Education is a national prerogative, but the need for harmonization in Training Programs is an obligation in order to more satisfactorily fulfill the Bologna Declaration about the free movements of Doctors in all EU countries.

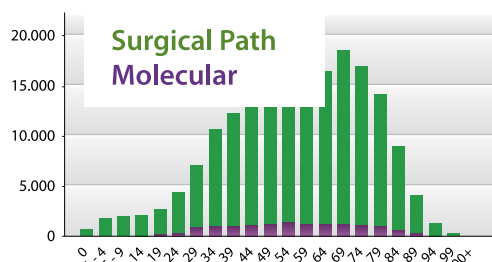
Union Européenne des Medecins Specialists (UEMS) produced European Training Requirements (ETR) for each Medical Specialty, and last year the Pathology ETRs were approved during the UEMS General Assembly in London. ([https://www.eums.eu/\\_data/assets/pdf\\_file/0006111795/UEMS-2019.44-European-TRaining-Requirements-on-Pathology.pdf](https://www.eums.eu/_data/assets/pdf_file/0006111795/UEMS-2019.44-European-TRaining-Requirements-on-Pathology.pdf)), where three areas were identified, namely the Residency program and achievements, the trainers and the training center qualifications and facilities. In these ETRs, we stressed that pathology is a specialty in which **time, pre-analytical and technical procedures** are critical, in the everyday routine practice and when during open surgery the modality choice and the rapid on-site evaluation of a frozen section require skills and highest scientific preparation of the dedicated specialist.

Pathology encompasses knowledge and skills of surgical pathology, autopsy pathology and cytopathology and *additional* competences in areas of special interest such as dermatopathology, forensic pathology, neuropathology, paediatric pathology, cardiovascular pathology and paleopathology.

Finally, patient education and public health aspects must be also be considered.

Nowadays, is clear how pathology plays a fundamental role in modern healthcare systems, addressing the comprehensive diagnostic *needs* of all patients, *coordinating and directing* the therapy choices. The pathologist must possess not only the essential scientific knowledge and skills necessary for complete and correct diagnosis, but also the *organizational insights* and capabilities needed to work efficiently in the pathology laboratory/department, cytopathology office, the autoptic and forensic department, additionally joined with molecular biology facility and other *modern technologies* (eg. bioinformatics, biobanking).

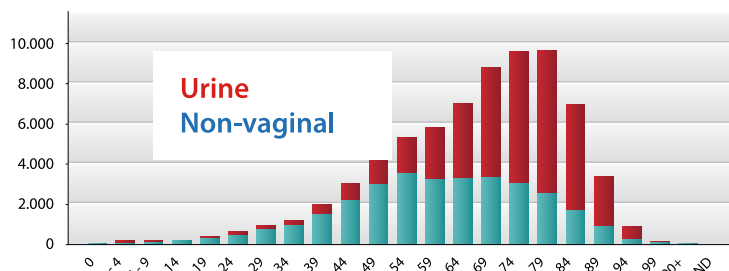
Obvious knowledge and data from Hospitals all around the world were confirmed by a rapid survey of



2015–2019 Surgical and Molecular

Pathology (171644)

M 71008 F 100636



Clinical Cytopathology 2015–19

Non-vaginal 25025 M 8473 (34%) F 16552 (66)

Urine Cytology 30918 M 21794 (70,5) F 9124 (29,5)

the activity of the Department of Medicine, Section of Pathology and Cytopathology of Padova University clearly demonstrating the evident increase of disease in advancing age.

The problem of aging is common for the entire world. The problem of rapid population aging is especially pressing in China, as its population aging rate and aging dependency growth are among the fastest in the world, with the absolute number of the elderly being the largest in the world (about 167 million or 12% of the country population over 65 in 2019, which will grow to as much as 330 million or about 26% by 2050). As the aging health problems increase, so do in-

However, this evidence appears to be sort of neglected in the EU education system, at the contrary for instance to the attention given to the medicine of gender, and, at least in Italy, the few gerontology departments have been closed and patients transferred to general internal medicine wards. Advanced age is not a disease, instead should be regarded as a resource, but if “advanced aged” subjects become patients, their diseases should be reconsidered with the psychological attitudes, social and familiar situation, mental and physical performance status, along with the characteristics of the disease.

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## A1-II

# Changing Pathology of Ageing Society

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crease the capabilities of biomedical science and technology to solve the related problems. For example, 5G technology will allow us to develop from information sharing to internet of things (IOT). Artificial intelligence (AI) will greatly improve our ability to understand and solve complex problems, while the breakthroughs in stem cell technologies and other geroprotective therapies will allow us to redefine healthy aging and to completely treat major diseases.

The world is facing an unprecedented situation! There are more older people than children and more people at extreme old age than ever before. As the proportion of older people and the length of life increase throughout the world, key questions arise. Will population ageing be accompanied by a longer period of good health, a sustained sense of well-being, extended periods of social engagement and productivity, or will

it be associated with more illness, disability, and dependency? Ageing will affect health care and social costs.

Global efforts are required to understand and find cures to prevent diseases like Alzheimer and frailty and to extend existing knowledge about the prevention and treatment of heart disease, stroke, diabetes, and cancer.

The improvement in life expectancy is accompanied by the rise in chronic non-communicable diseases such as heart disease, diabetes and cancer. They reflect changes in lifestyle and diet and ageing. The economic and societal costs of non-communicable diseases of this type rise sharply with age.

Ageing is characterised by a progressive degeneration of the tissues that has a negative impact on the structure and function of vital organs. Loss of physiological integrity, a reduced capacity to respond to environmental stimuli with age contribute to increased risk of disease and death. Ageing is among the most important known risk factors for most chronic diseases. In general, it is determined by the interaction between injury and repair and the balance between cell death and cell replacement to maintain organ integrity. If cells die faster than they can be replaced, the remaining cells need to respond to greater demands that can eventually lead to pathological changes and deterioration in cell health. Factors that modify the balance between cell death and replacement have considerable impact on the ageing process.

One common factor underlying the process of ageing is the accumulation of molecular damage and ageing may be considered to result from the accumulation of cellular damage, consequent changes in gene expression and epigenetic factors related to DNA damage, and structural modifications of the DNA such as telomere shortening. Thus, ageing is influenced by the interaction of genetic and environmental factors. Two main theories of ageing are the free radical theory and the replicative senescence theory.

Evidence is accumulating that an optimal amount of radical oxygen species (ROS) are required for ageing. They can trigger proliferative and survival signals in response to physiological and stress signals. With ageing, levels of ROS increase in an attempt to maintain survival until they reach a level where they enhance age-related damage. ROS can also be formed by exogenous processes such as irradiation, environmental pollutants and inflammation, and normal cell metabolism. Free radicals can accelerate replicative senescence via shortening of telomeres, activate inflammatory redox-sensitive transcription factors like nuclear factor- $\kappa$ B (NF- $\kappa$ B) that regulate transcription of genes encoding pro-inflammatory cytokines and induce DNA damage. Chronic inflammation, characterised

by higher levels of pro-inflammatory cytokines and the infiltration of inflammatory cells into tissues, is a feature of ageing and most age-related diseases including COPD, cardiovascular disease, osteoporosis, rheumatoid arthritis, cataract and Alzheimer's disease.

The other theory of ageing is the replicative senescence theory based on the fact that with every cell division there is incomplete duplication of the telomeres at the ends of chromosomes containing 1–5 kb of (TTAGGG) repeats that protect DNA against degradation and recombination, thus supporting chromosomal stability. In most somatic cells telomeres shorten with every cell cycle since replicative DNA polymerases lack the capacity to completely replicate the terminal ends of linear DNA molecules, which is a property of the specialised DNA polymerase known as telomerase. Most mammalian somatic cells do not express telomerase which leads to loss of telomere protective sequences at the ends of chromosomes. This is a result of the replication history, but also of a number of factors, such as cumulative oxidative stress and chronic inflammation, acting on progenitor cells. Successive cell divisions result in telomere shortening of chromosomes until cells are no longer capable of dividing. Therefore, the balance between cell death and cell replication is affected and defence, maintenance and repair of the body becomes increasingly impaired. Telomere length is considered as a measure of biological rather than chronological age or as a biomarker of somatic redundancy that is the body's capacity to absorb damage. There is a strong relationship between short telomeres and the risk of mortality.

To conclude, understanding the mechanisms of ageing may provide a novel target for the treatment of this condition.

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## Oral presentations

### A1-01

## The Joint Programme for Neurodegenerative Diseases (JPND), Towards a Globally Shared Brain Health

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The Joint Programming Initiative was originally created as a Member States-led initiative in Europe. It aims to address “grand challenges” to the EU and global society by coordinating national research programmes to increase the impact and effectiveness of research efforts. Neurodegenerative diseases (ND) and dementia in particular, represent one of the world’s most pressing medical and societal challenges and the solutions are likely beyond the scope and resources of any single country. JPND aims to find causes, develop cures and identify better ways of caring for people with neurodegenerative diseases. Although JPND was originally a European initiative, it has since then gone global, with 30 countries participating today. Since its creation, JPND has raised more than €200 million for ND research. The tremendous progress of medicine in the last 50 years has led to a huge increase in total life expectancy for each of us. However, longer life expectancy without disability is greatly dependent upon our brain health: neurodegenerative diseases and dementia affect one third of the aging populations over 85 years of age, mental health disorders including addictions affect 12% of the entire population and neurodevelopmental disorders affect 15% of children. This problem will only get worse as the European and global population inexorably ages. Together with JPND, several large European Commission (EC) initiatives have been established in Europe, to collectively face these huge challenges, namely: NEURON, an ERANET in the other fields of brain health and the Human Brain Project, an EC research flagship. These initiatives have addressed research questions related to determinants of mental health (from depression to addictions and compulsive disorders), neurodegenerative diseases (from Alzheimer’s disease and Parkinson’s disease to related disorders) and neurodevelopmental disorders (disturbance of the development of the central nervous system). Since last year, all three initiatives have begun discussions in the context of EBRA (European Brain Research Area), to find operational synergies and identify gap. All these three initiatives have now

acquired invaluable experience and trust. Strongly supported by the EC and Member States, the initiatives encompass significant non-European international partners. This has allowed for the development of a unique holistic view of the European Brain Health research. By integrating such cutting-edge research dynamics and initiating an active translational momentum, the way for a powerful innovative force ready to consolidate an ambitious partnership on Brain Health in Horizon Europe is paved.

### A1-02

## Healthy Ageing in Men: How to Prevent Andropausal Syndrome?

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The advanced age in men is connected to an array of health disorders that bring significant pressure on public health system. The main androgen in men, testosterone, tends to decrease by 1–2% per year after age of 40. According to the European Male Ageing Study, there is a significant prevalence of low androgens levels (also known as “biochemical hypogonadism”) in aging men (40 – 79 years old); it is estimated to be 23.3%. Reduced serum levels of testosterone can occur in both young and aging men. A significant decline in serum testosterone levels affects about 5 million men in USA, including 20%–50% of men over age 60. Other men who also present themselves with biochemical hypogonadism include those with sickle cell disease and spinal cord injury, hypogonadotropic hypogonadism and primary testicular deficiency (primary hypogonadism). However, majority of men with biochemical hypogonadism remain asymptomatic. Those who became symptomatic have broad spectrum of symptoms such as sexual dysfunction, metabolic disorders, overall dissatisfaction, as well as increasing emotional disturbances, moodiness, irritability, nervousness, depression, fatigability, poor concentration, and deteriorating memory. All these symptoms are known as andropausal syndrome. The main source of androgens in men are Leydig cells (>95% of testosterone production). The rest of androgens are coming from the cortex of suprarenal gland. In ageing men, Leydig cells seem to be less responsive to LH. Moreover, this less responsiveness is often combined with other comorbidities such as metabolic syndrome, prediabetes and

diabetes, adiposity, cardiovascular problems, psychological disturbances (including dementia) and osteoporosis. Early recognition/screening programme of biochemical hypogonadism and andropausal syndrome in particular is critical in prevention of ageing symptoms mentioned above. The screening programme may, among other parameters, include measurements of total testosterone, free testosterone, dehydroepiandrosterone sulfate, and insulin-like growth factor 1. Androgen substitution therapy is one of the strategies how to fight andropausal syndrome.

### A1-O3

## Representative Model of Sporadic Alzheimer's Disease and Its Use for Testing of Novel Therapeutic Strategies

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Ageing has imposed itself as a major risk factor in development of Alzheimer's disease, particularly its sporadic form (sAD) which affects about 13% and 50% of patients aged >65 and >85 years, respectively. sAD is an incurable neurodegenerative disorder characterized by a progressive memory loss. It presents the most common cause of dementia affecting over 45 million people world-wide. Type 2 diabetes mellitus (T2DM) stands out as the most prominent age-related risk factor associated with sAD. Recent data suggests that sAD and T2DM can be considered as "syndrome of accelerated ageing" so elucidation of their common pathophysiology, and their prevention and treatment is of utmost importance for healthier ageing. Brain insulin resistance (BRI) has emerged as a potential link between metabolic and cognitive dysfunction shared by sAD, T2DM and aging, in addition to oxidative stress and neuroinflammation. Thus, approved antidiabetic drugs like glucagon-like peptide-1 (GLP-1) receptor agonists are now being tested as suitable candidates for sAD treatment. Ineffectiveness of the available symptomatic AD therapy and a failure of pharma industry in new AD drug development imposed an urgent need for a successful disease-modifying drug which should be tested in a representative sAD animal model. We have developed a non-transgenic rat sAD model based on the administration of streptozotocin (a compound which following a peripheral administration of high dose induces diabetes mellitus) into the lateral brain ventricles (STZ-icv model). The model

develops BIR (but not systemic diabetes) and our research on its further characterization has demonstrated that the model eventually manifests many sAD-like behavioral (cognitive decline), neuropathological (amyloid  $\beta$ /tau protein accumulation, oxidative stress, neuroinflammation), and cerebral structural (cortical thickness) and metabolic (glucose hypometabolism) characteristics. We use the STZ-icv rat model also as a platform to test novel therapeutic strategies in sAD treatment. Our current research explores stimulation of the endogenous GLP-1 by oral galactose with preliminary results indicating that 2-month daily exposure to oral galactose initiated in the early sAD-like stage improves impaired learning and memory functions in STZ-icv treated rats accompanied by normalization of brain glucose hypometabolism, increments in active plasma GLP-1 levels and increased expression of GLP-1 receptors in the brain. Determination of the therapeutic potential and limitations of this novel nutrient-based therapeutic approach in sAD treatment is in progress. Funded by the Croatian Science Foundation IP-2014-09-4639, IP-2018-01-8938.

## Poster presentations

### A1-P1

## Diagnostic, Prognostic and Predictive Biomarker Testing in Pathology – Needs and Opportunities in Solid Tumour Oncology of the Ageing Society

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Neoplastic disease are, having some exceptions in the field of hemato- and neuropathology, by far more common in older people. The theoretical basis of this is wide, not always will be defined by clearly including passing of time as one of the key factors. Simply being around for a longer time period makes us more exposed to intrinsic and extrinsic stressors, meanwhile diminishing our defense mechanisms and capacity. In today's medicine the recently widely opened field of new drugs enabling more directed, „individualized“ therapy is currently representing the backbone of a rapidly evolving success in fighting cancer. In most instances these „smart“ drugs need „smart“ diagnostic tools in order to better define targets for tailored therapeutic approach. Despite the fact that currently most of this happens in the field of genetics, the story begun with hormones – ER i PgR in breast cancer being the first targets of a directed therapy. The next step was also breast cancer – HER-2 (already an amplified gene receptor from the EGFR family). After a relatively silent period (in which we got the c-kit mutated positive GIST as a target of imatinib mesylate) an explosion happened. In the last ten years we are witnessing inclusion of more and more mainly genetically targeted therapy – RAS in metastatic colon cancer and EGFR TKI's leading the group, followed by ALK, ROS and MET in lung cancer, BRAF in melanoma (and lung cancer) and BRCA in triple negative breast and serous ovarian cancer. As of last year the 1p/19q co-deletion is a WHO recognized biomarker in oligodendroglioma. Meanwhile especially in soft tissue and bone tumors a wide array of diagnostic biomarkers is evolving, with so far little or no therapeutic consequences. Ever sophisticated technologies are today opening widely the field of multigene testing, meanwhile also opening the question of rationalizing diagnostic efforts. Commercial suppliers introducing several strategic, financial and ethical questions often offer this type of testing an open a wide field for discussion.

Should we test everyone? Should we diagnose genetic changes with not known targets? Should we invest more into treating known targets with known drugs or should we try to come to the genetic basis of every malignancy, despite the costs and with doubtful rationale? Can we (financially) treat all our patients with the most high-end therapy? We have many difficult questions to answer but live one of the most exciting periods in modern oncology.

### A1-P2

## Early Diagnosis of Hidden Hearing Loss as the Prevention of Hearing Impairment in Older Working-age Population

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**Introduction.** Noise-induced hearing loss (NIHL) is preceded by a cochlear synaptopathy and a consequential hidden hearing loss (HHL) with no shift in hearing threshold. In middle-aged working-age population, HHL or NIHL are exacerbated by the onset of age related-hearing loss. The hearing threshold usually shifts bilaterally at high frequencies after years of exposure to noise intensity levels greater than 87 dB(A) during the 8-hour working day. The objective was to analyse the applicability of existing procedures in the diagnosis of HHL in order to prevent further noise exposure and the following hearing impairment. **Methods.** Literature review was made in PubMed Database using keywords: age-related hearing loss; noise-induced hearing loss; hidden hearing loss. We did our research on studies published in the past 20 years. **Results.** As a direct measure of the cochlear synaptopathy degree, some studies suggest the reduction in the auditory brainstem response wave I amplitude and others an increase in the ratio of summing and action potential. However, wave I amplitude is highly variable in humans, and it is not completely clear how loss of cochlear synapses leads to an increase of summing potential. Loss of synapses was also found in autopsy material of otologically healthy persons, suggesting that this synaptopathy may be independently mediated by aging. On the other hand, prolonged noise exposure at the workplace increases sympathetic activity and causes an increase of the cortisol concentration in the blood. This increase is consistent with

the increase of salivary cortisol and salivary cortisone concentrations easily measured during the workday. **Conclusion.** Auditory and extra-auditory noise effects should be observed simultaneously and measured non-invasively. Except standard audiological test battery, electrophysiological results, such as auditory brainstem response findings should be also taken into account and supplemented by psychometric and hormonal findings. With such diagnosis and with evidence of excessive noise exposure, it is important to

find technical solutions or restrict the work in such hazardous working environment and to advise workers on the use of personal protective equipment with regular supervision. Further studies should explain the relative contribution of noise exposure and age, respectively, to the development of cochlear synaptopathy. This kind of approach to the early diagnosis could significantly reduce the risk of developing severe hearing loss in older age and eventually increase the work capacity of noise-exposed workers.

## Session A2: Molecular Basis of Ageing

### Invited lecture

#### A2-I

### Lifespan and Health Span in Mice: Mechanisms and Interventions

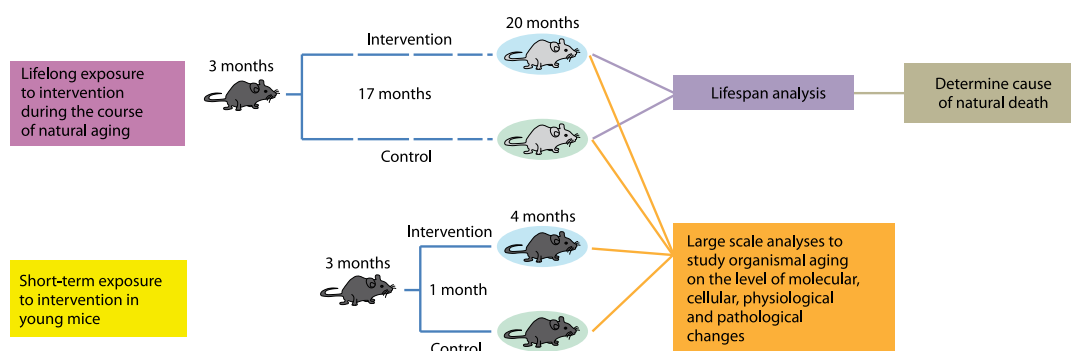
Dan Ehninger

German Centre for Neurodegenerative Diseases, Germany

Aging is a major risk factor for a large number of adult-onset disorders, including neurodegenerative disorders, cardiovascular diseases and cancers, and is associated with a broad range of functional impairments. Targeting aging processes with suitable pharma-

scale analyses of aging-associated molecular, cellular, physiological and histopathological changes constitute an effective approach to identify and dissect possible treatment or prevention effects in animal models.

This presentation will cover data detailing how aging phenotypes, in a range of physiological systems, unfold across the lifespan of mice and humans. Moreover, I will share data examining how key biological processes implicated in aging change over the murine lifespan. Finally, I will discuss the question to what extent lifespan-extending manipulations slow mammalian aging rates and promote overall healthy aging in mammals on the level of organs and tissues. The line of work discussed exemplifies a research approach that is key for providing a foundation for translational opportunities that link the biology of aging to new medicines for the prevention of a broad range of age-related diseases.



cological or dietary interventions could potentially represent a powerful inroad for the development of preventatives or treatments for aging-associated disorders.

A large number of genes and pathways have been identified that extend lifespan in invertebrates. In some cases, analogous manipulations have been shown to also extend lifespan in mammals. Relatively underexplored, however, is the question to what degree these lifespan-extending manipulations also slow mammalian aging rates and promote overall healthy aging in mammals on the level of organs and tissues. Large-

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## Oral presentations

### A2-O1

## High Capability of Human Prefrontal Cortex Microcircuitry to Maintain Its Structure During Ageing

Zdravko Petanjek, Ana Hladnik, Ivana Bičanić, Domagoj Džaja, Dora Sedmak, Ivan Banovac, Andrea Blažević, Sanja Damopil

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We analyzed changes in dendritic morphology and spine density on associative layer IIIc cortical projecting neurons and large layer V subcortical projecting pyramidal neurons to establish age-related changes within microcircuitries of the human prefrontal cortex (Brodmann area 9). Postmortem human brain tissue of adults was processed using the rapid Golgi method in two age groups: 38 – 64 years ( $n = 8$ ) and 72 – 91 years, ( $n = 7$ ). Neuropathological findings were unremarkable in all analyzed brain specimens. From each layer, the basal dendritic arbor and side dendritic branches from 10 – 15 well-impregnated pyramidal neurons per subject were three-dimensionally reconstructed using Neurolucida software. Soma size, total dendritic length, total segment number, individual segment length and spine density were quantitatively analyzed. Regarding layer V neurons, no significant differences were observed between adults and the elderly, either for dendritic morphology or for the spine density. The interindividual differences in the elderly group were however higher than in adults. Regarding associative layer IIIc pyramidal neurons, the mean values of spine density, on both side branches and basal dendrites, were 20–25% lower in the elderly than in adults ( $p = 0.07$ ). In two aged cases the spine density was around mean level of adult and in the remaining aged subjects values were lower than in all adult subjects. These data show that the dendritic morphology and synaptic connectivity of the major classes of principal neurons in higher order associative areas are largely preserved in aging, while the connectivity of associative cortico-cortical layers is more prone to regression.

### A2-O2

## Antioxidant Ameliorated Negative Impact of a DNA-Demethylating Agent on Placental Growth and Morphology of Aged Preterm Placentas

Nikola Sobočan<sup>1,2</sup>, Ana Katušić-Bojanac<sup>1,3</sup>, Nino Sinčić<sup>1,3</sup>, Marta Himelreich-Perić<sup>1,3</sup>, Jure Krasić<sup>1,3</sup>, Željka Majić<sup>1</sup>, Gordana Jurić-Lekić<sup>1,4</sup>, Ljiljana Šerman<sup>1,3</sup>, Maja Vlahović<sup>1,3</sup>, Andreja Marić<sup>5</sup>, Davor Ježek<sup>1,4</sup>, Floriana Bulić-Jakuš<sup>1,3</sup>

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**Introduction and Objectives.** We showed that a DNA-demethylating agent/ epigenetic drug 5-azacytidine (5azaC) used in treatment of human malignancies is a teratogen that impaired development of both embryos and placentas in treated rat dams, while pretreatment with the antioxidant N-tert-Butyl- $\alpha$ -phenylnitron (PBN) improved development of rat fetuses. We now investigated whether PBN could improve the placental development and aging. **Methods.** On the 12th and 13th days of gestation, Fisher rat dams were pretreated by an i.v. injection of PBN (40 mg/kg) and one hour later by an i.p. injection of 5azaC (5mg/kg) or only with 5azaC. Controls were treated only with PBN or were sham- treated. On the 15th and 20th days of gestation placentas were weighted. Immunohistochemical signals of the Proliferating Cell Nuclear Antigen (PCNA) and markers of oxidative/nitrosative processes (8-oxoDG and nitrotyrosine, respectively) were stereologically quantified by the numerical density (Nv). Apoptotic index was calculated and DNA-methylation was assessed by pyrosequencing. All results were statistically evaluated. **Results.** Pretreatment with PBN ameliorated placental morphology of aged preterm 20-days-old placentas which was disturbed by 5azaC. PBN-pretreatment significantly improved weight of 15- and 20-days old placentas. In aged preterm placentas apoptotic index was significantly lower in samples pretreated with PBN than in only 5azaC treated, and that was associated with a significantly lower Nv of 8-oxoDG and nitrotyrosine. Nv for the cell proliferation marker (PCNA) was significantly lower in all treated with 5zaC than in controls. **Conclusions.** Pretreatment with the antioxidant PBN ameliorated negative impact of the DNA-demethylat-

ing epigenetic drug on the aged, preterm placentas. Because DNA demethylation causing oxidative stress might also be of importance for placental premature aging during human gestation, we propose further investigation of the antioxidant PBN activity.

## A2-O3

# Glycans as Biomarkers and Functional Effectors of Age and Age-Related Diseases

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The majority of proteins that evolved after appearance of multicellular life are glycosylated and glycans significantly affect structure and function of these proteins. However, due to structural complexity of glycans and the absence of a direct genetic template, the analysis of protein glycosylation is much more complicated than the analysis of DNA or proteins. Consequently, the knowledge about the importance of individual variation in glycans for both normal physiological processes and diseases is still limited. In the last few years it is becoming increasingly clear that variations in a DNA sequence are only a beginning of the understanding of complex human diseases. Genetic polymorphisms have to be put in the context of complex biology of life and a more elaborate approach that combines different 'omics phenotypes is needed to understand disease mechanisms and perform patient stratification that transcends genomics. Glycomics, as by far the most complex posttranslational modification, has an immense potential in this respect, which is only beginning to be investigated. By generating glycomic data for over 100,000 individuals from some of the best characterized clinical and epidemiological cohorts we enabled glycomics to meet other 'omics. The analysis of this rich gold mine is painting a picture of a very complex genetic and epigenetic regulation of glycosylation that fine tunes protein activity in multiple biological systems and also contributes to ageing at the molecular level. In particular, the evidence is accumulating that in cardiometabolic diseases changes in glycosylation are not only biomarkers, but functional effectors that actively participate in disease development.

## Poster presentations

## A2-P1

# Senescent Phenotype and Disturbances in Autophagy in ATM-Deficient Neural Precursor Cells

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ATM is a kinase involved in DNA damage response (DDR), regulation of response to oxidative stress, autophagy and mitophagy. Mutations in the ATM gene in humans result in ataxia-telangiectasia disease (A-T) characterized by a variety of symptoms with neurodegeneration and premature ageing among them. In this study, we have focused on the process of senescence in A-T cells. Given that brain is one of the most affected organs in A-T, we turned our attention to neural progenitor cells (NPCs) derived from A-T reprogrammed fibroblasts. We observed that A-T NPCs obtained through neural differentiation of iPSCs in 5% oxygen possessed some features of senescence including increased activity of SA- $\beta$ -gal and secretion of IL6 and IL8 in comparison to control NPCs. This phenotype of A-T NPC was accompanied by elevated oxidative stress resulting in 4-HNE protein modification. A-T NPCs exhibited symptoms of impaired autophagy and mitophagy with lack of response to chloroquine treatment. Additional sources of oxidative stress like increased oxygen concentration (20%) and H<sub>2</sub>O<sub>2</sub> respectively aggravated the phenotype of senescence and additionally disturbed the process of mitophagy. The latter was confirmed by transcriptional analysis of several mitophagy-associated genes. In both cases only A-T NPCs reacted to the treatment. We conclude that oxidative stress may be responsible for the phenotype of senescence and impairment of autophagy in A-T NPCs. Our results point to senescent A-T cells as a potential therapeutic target in this disease.

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## Session A3: Ischemic, hypoxic, hemorrhagic brain disorders &amp; ageing

## Invited lecture

## A3-I

## Idiopathic Rapid Eye Movement Behaviour Disorder

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Idiopathic rapid eye movement (REM) sleep behavior disorder (iRBD) is increasingly recognised as an important precursor disease state of alpha-synucleinopathies. This parasomnia is characterized by a history of recurrent nocturnal dream enactment behaviour, loss of skeletal muscle atonia, and increased phasic muscle activity during REM sleep. Neuroimaging studies of striatal dopamine transporter uptake tracer signalling suggest increasing dopaminergic deficit across the continuum of the alpha-synucleinopathies, with early sleep dysfunction suggestive of early caudate dysfunction. We will discuss the implication of utilising this window of the opportunity in the disease process to intervene, and to potentially abort, further development of neurodegenerative process.

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## Oral presentations

## A3-O1

## Obstructive Sleep Apnoea Assessment in the Elderly

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Obstructive sleep apnea (OSA) is one of the most common sleep related breathing disorders characterized by repetitive episodes of complete (apnea) or partial (hypopnea) cessations of breathing due to obstructions in upper airways followed by significant oxygen desaturations. Chronic intermittent hypoxia combined with frequent arousals during sleep results with dysfunction of autonomic nervous system that promotes development of hypertension, glucose intolerance, cardiovascular and cerebrovascular disorder. Prevalence of OSA tends to increase due to increased prevalence of obesity and ageing of the population. OSA has negative impact on health and quality of life and aggravates ageing and ageing-related diseases and comorbidities. As such, OSA should be adequately screened in order to apply adequate medical care especially in the elderly. Different clinical models have been developed to evaluate patients who are at risk for OSA. Usually we use screening questionnaires such as STOP (Snoring, Tiredness, Observed apnea, and high blood Pressure) and STOP-BANG (STOP + Body mass, Age, Neck circumference, Gender), which are concise and easy-to-use in daily clinical practice. In a large sample of 4136 subjects from the area of Split and Split-Dalmatia County, screened with STOP questionnaire we found that the risk for OSA steadily increases with age. Particularly vulnerable was the group of men aged 41–50 years, in whom the risk of OSA and associated excessive daytime sleepiness was significantly more pronounced compared to female respondents of the same age. In older population (> 60) we found highest risk for OSA, with women becoming at risk for OSA as much as men (55% vs. 51%). When we investigated the validity of OSA screening questionnaires against objective diagnostic polysomnography and polygraphy procedures, the STOP and STOP-BANG questionnaire revealed similarly high sensitivity (0.87), specificity (0.54) and positive predictive value (0.90) in the detection of OSA when applied in a population of

sleep clinics patients in Split Sleep Medicine Center. This indicates that the prevalence in general population is really high, and is strongly associated with ageing. Also, some recent publications indicate that screening for OSA among elderly were prevalence of OSA is as high as 83% requires modifications. Further validation studies of applied questionnaires designed specifically for the elderly population are necessary in order to reduce negative effects on health and avoid unnecessary and costly OSA diagnostic procedures.

### A3-O2

## I Forgot to Sleep

Domagoj Vidović<sup>1</sup>, Ana Marija Šantić<sup>1</sup>, Marina Mioč<sup>1</sup>,  
Ana Jadrijević-Tomas<sup>1</sup>, Hrvoje Grbavac<sup>1</sup>, Petrona Brečić<sup>1,2</sup>

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Sleep is essential for healthy living and relationship between dementia and insomnia is a complex one. Both conditions are highly prevalent among demented patients and sleep disorders, with insomnia in first place, makes things even more difficult to treat. Contemporary view on insomnia among demented patients and pathways to care will be explained. Non-pharmacological, often neglected methods should be tried out first, with somatic conditions, dose titration and side effects of medication being biggest obstacles in psychopharmacology. Personalized medicine approach regarding stage of dementia, housing conditions, caregiver's possibility and general medical condition should be implemented in treatment.

### A3-O3

## REM Behaviour Disorder and Neurodegenerative Disorders

Ana Marija Šantić

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Rapid eye movement (REM) sleep behavior disorder (RBD) is a sleep disorder characterized by enacting one's dreams during the REM sleep, with most of the dreams being violent or aggressive, so that patients often complaint to hurt themselves or bed partner during these episodes. Prevalence of RBD, based on population, is 0.38–2.01 %, but much higher in patients with neurodegenerative disorders, especially synucleinopathies. RBD may herald the emergence of synucleinopathies by decades, such that it may be used

as an effective early marker of neurodegenerative disorders, precisely synucleinopathies. Lesion or dysfunction in REM sleep and motor control circuitry in pontomedullary structures cause RBD phenomenology, and degeneration of these structures might explain the presence of RBD years or even decades before the onset of Parkinson's disease (PD), dementia with lewy bodies (DLB) and multiple system atrophy (MSA). RBD occurs in 30–50 % of patients with sporadic PD, preceding the onset of parkinsonism by several years in about 20 % of them. The majority of patients with MSA have RBD, recent meta-analysis reported prevalence of clinically suspected RBD in MSA of 73 %, while polysomnographically confirmed RBD was up to 88 %. RBD is recognized as one of the core features of DLB and may occur either in advance or simultaneously with the onset of DLB. The prevalence of RBD in DLB is up to 76 %. On polysomnography RBD is presented as repeated episodes of vocalization and/or complex motor behaviors during REM sleep which reflects the loss of normally present atonia in REM (i.e. REM sleep without atonia – RSWA). Sometimes when typical behaviors are not seen in polysomnography but are known to exist based on medical history, even the presence of RSWA is sufficient to diagnose patients with RBD. In cases of idiopathic RBD, precisely those patients who at the time of diagnosis don't exhibit clinical signs of Parkinson disease, DLB or MSA, the treatment is mainly symptomatic and is based on lowering motor activity in sleep, promoting sleep continuity and readdressing sleep desynchronization. Clonazepam and melatonin are main substances used in treatment. While there is not known effective neuroprotective substance yet, it is important to recognize these parasomnias as they can precede typical motor and cognitive symptoms of neurodegenerative diseases by many years and as such demand regular neurological and neuropsychological follow-up.

## Poster presentations

### A3-P1

## Predictors of Sleep Quality in Older Adults in Zagreb

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The changes in sleep-wake process over the lifespan are well established. Epidemiological data show that 50–65% of older adults report impaired sleep quality (SQ). This impairment can rather be attributed to health status and various psychosocial factors than to the aging process per se. The results of our previous study showed the expectedly impaired SQ in nursing home residents, best predicted by self-perceived health and functional ability. The aims of the current study were to examine SQ of older adults living in different arrangements and to examine factors contributing to their SQ. Participants were 334 older adults (73% females) from Zagreb. Half were the NH residents and half OH residents. Their dominant age was 78 years, varying between 69 and 100 years. All were ambulatory, without diagnosis of dementia. Trained interviewers collected data individually, through structured interviews in nursing homes and in gerontology center. Questionnaire comprised of general questions, questions to assess self-perceived health and standardized scales to measure social participation, functional ability, life satisfaction, and SQ. SQ was assessed by the Pittsburgh Sleep Quality Index (PSQI). Our results showed PSQI score greater than 5, indicating poor SQ in 60% of older adults. In NH residents the percentage was higher than in OH residents (71% vs. 50%,  $p < .001$ ). Selected set of predictors explained small but significant proportion of variance in PSQI score and 7 domains. Predictors explained the highest proportion of variance in the use of sleep medication (22.6%) and subjective SQ (21%). Expectedly, women had poorer total PSQI, longer sleep latency and used more sleep medication than men. Older age significantly predicted only the use of sleep medication, as was expected within this age range. Living in NH predicted worse PSQI, shorter sleep duration, less sleep efficiency, more use of sleep medication and poorer daytime functioning. Greater life satisfaction predicted better total PSQI, higher subjective SQ, longer sleep duration, shorter sleep latency, less sleep disturbances and

less use of sleep medication. Poorer self-perceived health predicted poorer PSQI, worse subjective SQ, more sleep disturbances and more use of sleep medication while better functional ability predicted shorter sleep latency and better daytime functioning. Separate predictors' analyses of NH and OH older adults are called for to enable tailoring preventive strategies according to specific needs. Contribution of psychosocial factors in SQ prediction in older age points to the necessity of investment in sleep hygiene education and psychosocial support, especially to NH residents.

### A3-P2

## Patient-Centred Care Based on Fog Computing Paradigm: A Case of Sleep Apnoea Detection

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**Introduction and Objectives.** Sleep apnea is medical condition that affects about 4% of the population and may cause various medical complications such as fatigue, hearth problems and elevated blood pressure, diabetes type II, metabolic syndrome and others. Nowadays, there is a huge demand for technology solutions and new care models that will help in understanding patient's needs and characteristics, facilitating treatment adherence and shared-decision making. **Methods.** This paper proposes a system and methodology based on fog computing paradigm to unobtrusively detect sleep apnea and to enable patients with sleep apnea and health care providers to be active participants and collaborate in chronic disease management. The methodology is based on findings that sleep apnea is accompanied by body or leg movement. Therefore, the proposed system uses non-invasive PIR and piezoelectric-based sensors placed under the mattress. Data processing and sleep apnea detection is performed by machine learning algorithms on the edge nodes. Anonymized data are also sent to the cloud for further evaluation and assessment by medical experts and are used for model improvement. **Results.** In order to evaluate the proposed system and methodology, an experiment for continuous monitoring of a single person over a period of 8 hours was conducted. Signals obtained from PIR and bed sensors were segmented and signal features were extracted. Depending on the window length 250 to 270 features in total were

generated, and then reduced to 32 by discarding those with low importance or high data drift sensitivity. Four machine learning algorithms for sleep apnea detection were applied on the obtained feature set and the results were compared. The accuracy of the different classifiers based on different sliding window configurations was analyzed. It was found that, as windows length increases, the accuracy increases too. When using windows of 5 seconds the accuracy was 80%, when the window length was increased to 10 seconds, the accuracy raised to around 90%, and for 20 seconds windows, the accuracy further improved to above 95%. **Conclusions.** The use of novel technology, like unobtrusive sensors and fog computing, can improve the patient-centered care for patients with sleep apnea. The flexibility of the fog architecture enables better placement of computing and network resources. The fact that accuracy is increasing for larger window length is an important discovery. It can be used for design of a system that makes several predictions at the same time. In this proof the concept of the proposed system architecture we have conducted experiment with only 3 patients, which has to be increased.

### A3-P3

## Treatment of Sleep Disorders in Elderly

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Changes in sleep architecture and duration are a part of a normal ageing. It is crucial not to mistake sleep disorders for physiologic changes in sleep-awake patterns in elderly because untreated sleep disturbances may predict the risk of dementia and they are associated with worse late-life cognition.

Frequent sleep disorders in elderly include: insomnia, obstructive sleep apnoea (OSA), restless legs syndrome (RLS), circadian rhythm sleep disorder with phase advance and REM behaviour disorder (RBD). Treatment of these disorders include different pharmacological measures and non-pharmacological activities which include stimulus control, sleep hygiene education, relaxation therapy, cognitive behavioural therapy, bright light therapy and CPAP for OSA.

Pharmacologic treatment of sleep disorders should be taken with extreme care in older individuals. There is a greater risk of side effect even at lower doses and interactions with concomitant medications. Benzodiazepines and nonbenzodiazepine receptor agonists often used for treating insomnia can lead to tolerance, dependence, rebound insomnia, daytime sedation,

motor incoordination, cognitive impairment and increased risk of falls in institutionalized older individual. Because of these adverse effects and superior response seen in cognitive behavioural therapy, use of these drugs should be avoided in older individuals. To avoid similar adverse effects in treating RBD with clonazepam, alternative therapy with melatonin receptor agonist is often used because it is safer and better tolerated. Treating of OSA has some different challenges. Very effective CPAP not only improves sleep quality and daytime sleepiness but adequate use of long-term CPAP therapy improves cardiovascular outcomes. The main problem of CPAP treatment in elderly is that studies show that CPAP adherence decreases as age increases, and it is particularly poor in patients aged >75 years. Individualized treatment and close monitoring could possibly improve compliance.

Sleep disorders are common problem in all age groups, particularly in elderly. If untreated they are associated with cognitive impairment so diagnosis and treatment of sleep disorders are of great importance for healthy ageing.

### A3-P4

## Obstructive Sleep Apnoea Aggravates Age-Associated Decline in Psychomotor Performance

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Ageing is associated with a decrease in various cognitive and psychomotor abilities as well as problem-solving tasks, probably due to simultaneous structural and functional changes in specific brain regions, precisely in the frontal lobes. In our study assessment of the dynamic properties of the central nervous system has been performed with the computerized psychomotor testing device composed of numerous different tests using chronometric approach. In a large sample of 3420 subjects, we demonstrated that age positively correlated with the reaction times in tests of discrimination of the light signal position, complex psychomotor coordination, and convergent thinking. Thus, our results support the concept of association of reduced cognitive and psychomotor abilities with the advanced age. The prevalence and severity of the obstructive sleep apnoea (OSA) increase with advanced age. Moreover, the untreated OSA is associated with various age-related disturbances, including decline in physiologi-

cal and psychological performances. However, does OSA aggravate age-related cognitive and psychomotor decline and to what extent remains to be evaluated. In another study, on a total of 103 patients with moderate and severe OSA, we demonstrated that severe OSA impaired the speed of perception, convergent, and operative thinking, indicated by prolonged reaction times in the perception of visual stimulus, solving simple arithmetic operations, and in tasks requiring psychomotor coordination of the upper and lower limbs. Furthermore, severe OSA decreased the stability toward the end of the test, indicating that OSA patients get considerably slower toward the end of tasks compared to control participants of the same age. Finally, in the test of the complex psychomotor coordination of the computerized psychomotor testing device, OSA patients had significantly more pronounced prolongation of the reaction times in comparison to the control subjects of the same age. In conclusion, both ageing and OSA are associated with the decline in cognitive and psychomotor performance. However, the impairments in complex psychomotor coordination of the limbs are more pronounced in apneic patients supporting the conclusion that OSA aggravates age-related decline in psychomotor performance.

### A3-P5

## Sleeping 8.5 or More Hours per Day – Is It Too Much? Characteristics of Very Old Persons (85+) According to Sleep Duration

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**Introduction and Objectives.** The extreme differences in daily sleep duration provoke questions on causality and “normal”/acceptable/recommended ranges. Specifically, it is often not clear whether and when should sleep duration be taken as a warning signal, especially when a person’s well-being is under the institutional responsibility, as in retirement homes. This study aims at determining characteristics differing long (8.5+ hours), short (<6.5 hours), and moderate/“normal” (6.5–8.0 hours) sleepers (in a 24h cycle) among the very old persons (85+ yrs.). **Methods.** The rich data collection on 327 very old persons living in retirement homes in Zagreb (HECUBA; CSF IP-01-2018-2497) has been analyzed contrasting three similarly sized groups: long-sleepers (95; 29.1%), short-sleepers (102; 31.2%), and moderate-sleepers (130; 39.8%). **Results.** Long-sleepers spend their leisure

time more frequently with friends/neighbors ( $p=0.013$ ) and less frequently walking ( $p=0.037$ ). They more frequently declare that somebody is with them during the night ( $p=0.020$ ), that they have help in their everyday activities ( $p=0.028$ ), and they are content with their present life ( $p=0.041$ ). They less frequently think that loneliness is one of the main problems of the elderly ( $p=0.033$ ). Long-sleepers less frequently report a chronic disease ( $p=0.033$ ), and take medications for heart/blood pressure ( $p=0.037$ ). Short-sleepers more frequently report that they were separated from their families because of their job ( $p=0.010$ ), they are less frequently content with their past life ( $p=0.013$ ), and now receive a lower pension (<4,000 HRK) ( $p=0.046$ ). They more frequently declare that nobody is with them during the evening ( $p=0.022$ ), and their main current problem is the feeling of uselessness ( $p=0.037$ ). Short-sleepers more frequently report depression ( $p=0.029$ ) and a chronic disease ( $p=0.047$ ). Moderate-sleepers more frequently have higher education ( $p=0.028$ ), report that because of their education they changed their residence ( $p=0.046$ ), and now have a higher pension (4,000–10,000 HRK) ( $p=0.036$ ). They are also more frequently parents ( $p=0.046$ ). Now they less frequently spend their leisure time with friends/neighbors ( $p=0.027$ ). Moderate-sleepers less frequently have heart problems ( $p=0.029$ ) but more frequently have osteoporosis ( $p=0.015$ ). **Conclusions.** The study showed that in long-lived individuals the sleeping duration is not related to sex and age/longevity or to the psychotropic drug usage, but is predominantly a reflection of the personality, quality of life, and life-long experience. The revealed pattern indicates that the very old persons sleeping less than 6.5 hours are the least content.

### A3-P6

## Cardiovascular and Metabolic Changes Related to Sleep and Ageing

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Sleep architecture and duration changes throughout the lifespan starting with dramatic changes during the first year of life, continuing to change through the childhood and finally becomes characterized by a reduction in sleep quality and quantity during ageing. Although total sleep time tends to remain constant, older people spend more time in the lighter stages of sleep, sleep latency might increase, REM sleep decline,

and sleep fragmentation occur. The prevalence of sleep disorders also tends to increase with age. As some sleep disturbances among the elderly could be considered as a physiological consequence of ageing, numerous sleep disturbances can be attributed to illnesses and the medications used to treat them. Snoring is the primary cause of sleep disruption for approximately 50% of older population. It is associated with overweight and often becomes worse with age. Loud snoring is particularly serious as it can be a symptom of obstructive sleep apnea (OSA). Sleep is considered to be a modulator of metabolic homeostasis. The impact of sleep duration and sleep-disordered breathing increases the risk for obesity, insulin resistance (IR), type 2 diabetes (T2DM), the metabolic syndrome, and cardiovascular disease risk and mortality. Prevalence of OSA is estimated to be 26% in adults 30–70 years old, and as high as 45% in obese adults. OSA is associated with ageing independently of obesity. The prevalence of OSA among older adults is substantially higher than in younger individuals. OSA is associated with an in-

creased risk for hypertension, possibly via blunting the normal nocturnal blood pressure dipping. The prevalence of OSA in adults with drug-resistant hypertension is as high as 83%. OSA is associated with an increased risk of atherogenic dyslipidemia in adults showing higher total cholesterol and LDL levels, higher triglycerides levels, and lower HDL levels. OSA also increases the risk of cardiovascular and cerebrovascular diseases. The Sleep Heart Health study found that OSA is a significant, independent risk factor for chronic heart disease and heart failure in men aged 40–70 years, and that OSA increases the risk for ischemic stroke; even in men with very mild OSA. In summary, evidence shows that OSA increases the risk of cardiometabolic morbidities in the context of obesity, hypertension, IR, and T2DM, atherosclerosis, CVD, stroke risk, and CVD-related mortality. Additionally, OSA is associated with ageing. Thus, untreated sleep apnea puts a person at risk for cardiovascular disease and metabolic disturbances, which increases significantly during ageing.

## Session A4: Neuroscience and Neurodegenerative Disorders and Ageing

### Invited lecture

#### A4-I

### The Impact of Neuroscience Research in Europe for Healthy Ageing

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With a rapidly ageing population, dementia — particularly, Alzheimer's disease (AD) — is a growing public health concern worldwide. In Europe, an estimated 10.9 million people live with dementia, and this number is expected to increase to 18.7 million in 2050. AD is the underlying cause in 70% of people with dementia. AD is a neurodegenerative disease that progresses in stages, beginning with a long silent phase before symptoms appear. The European Brain Council (EBC) is a network of key players in the "Brain Area", with a membership encompassing scientific societies, patient organisations, professional societies and industry partners. Its main mission is to promote brain research with the ultimate goal of improving the lives of the estimated 179 million Europeans living with

brain conditions, mental and neurological alike. With the aim to speak with one voice, EBC stands as the platform to foster cooperation between its member organisations and other stakeholders, consistently promoting dialogue between scientists, industry and society. Notably, EBC emphasizes the importance of raising awareness and encouraging education on the brain and the repercussions of neurological and mental health conditions on society as a whole; including diseases like dementia and neurodegeneration, which are strongly influenced by an ageing population, where an increase in healthy ageing is desired. The promotion of healthy ageing will have massive implications not only on health care costs but also on the quality of life for the elderly. In fact, as demonstrated by EBC, in Europe it has been estimated that the total cost of brain diseases on a yearly basis amounts to around 798 billion euro; for dementia only, the cost is 22.000 euro per patient, per year. These are facts and we need to face them: it is therefore obvious that research in the field of ageing and dementia is not only needed but it represents a societal obligation necessary to understanding the causes and developmental pathways of the disease, for its diagnosis, prevention and treatment. In this scenario, and as part of the EBC value of treatment project, the potential impact of a hypothetical Alzheimer's medicine was assessed by researchers from Maastricht University, the Karolinska Institute, the University

Medical Center Amsterdam and the London School of Economics. A treatment that would delay the rate of disease progression by 50% would have, as a consequence, a smaller proportion of people progressing to advanced stages of the disease. This would result in an increase of quality adjusted life years (QALYs), a measure for both quality and the quantity of life lived, of 1.75 per patient. Overall, a potential treatment is estimated to reduce the total lifetime care costs by 12.406 euro per person, per year. Considering the costs of dementia for the European society and that these costs will increase considerably in the coming years due to the ageing of the European population, one way of curbing this increase and eventually decreasing the costs is via intensified research. It is therefore important to focus our efforts on fundamental as well as in clinical neuroscience research. Only by improving the insight into the basic functioning of the brain and translating this knowledge to the disease state, understanding the causes of the disease process and paving the way for better targeted and improved treatment can the upwards spiral of the costs of brain disorders be stopped. Furthermore, there is a constant need for strengthening the information flow and accelerating the exchange of experience on the on-going and future projects as well as maintaining continuous dialogue between all the stakeholder groups at the national and European level and initiatives to allow that objectives are aligned, and needs are met.

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## Oral presentations

### A4-O1

## Genes and Mechanisms Modulating Ageing and Neurodegeneration Derived From Studying Down Syndrome

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Down Syndrome (DS) (caused by trisomy 21 (T21)) is an accelerated ageing condition on cellular and organism level. Paradoxically, people with DS have a much lower incidence and mortality from a range of solid tumours. They have an approximately 50–100 fold higher overall incidence of leukaemias in childhood than normal children, including all types of acute myeloid leukaemia (AML) and B-cell acute lymphoblastic leukaemia (ALL). Children with DS are prone to suffer a relapse and have a higher risk of death from therapy-related side effects. Paradoxically though, individuals with DS have a substantially reduced incidence of second malignancies following radiation therapy, even at a juvenile age, despite DS haematopoietic cells in vivo showing a significantly increased “passenger” mutation rate per year of age. We also detected that T21 causes a significantly increased number of DNA double strand breaks ( $\gamma$ H2AX foci) in undifferentiated proliferating hiPSCs, post-mitotic neurons derived from hiPSCs, as well as in a trans-chromosomal mouse model of DS. We also detected that IgG glycans in Down Syndrome individuals show extreme profiles that reflect accelerated aging. Experiments aimed at identifying the chromosome 21 genes whose trisomic overdose is responsible for accelerated ageing and neurodegeneration using iPSC and other cellular models are on-going using iPSCs from partial trisomy 21 cases, as well as CRISPR/Cas9-edited trisomy-correction for specific genes. Using isogenic T21-iPSC-derived cerebral organoids, we also identified a novel mechanism that delays the onset of Alzheimer's disease, despite the triplication of the myloid precursor protein (APP) gene in T21.

**A4-02****The ALZENTIA System:  
A Sensitive Non-invasive  
Hidden-Goal Test for Early  
Cognitive Impairment Screening**

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There is a need to identify reliable predictors of mild cognitive impairment (MCI) and dementia due to Alzheimer's disease (AD) in normal elderly people to enable timely intervention. The Mini-Mental State Examination (MMSE) is the best-known and the most often used short screening tool for providing an overall measure of cognitive impairment in clinical, research, and community settings. However, MMSE is not actually a mental status examination designed to detect dementia as it was originally developed to differentiate organic from functional psychiatric patients. The MMSE has low sensitivity in detecting dementia as well as poor specificity, and low negative (NPV), and positive predictive values (PPV), especially in early-stage AD. A recent systematic review also did not find evidence supporting a substantial role of MMSE as a stand-alone single-administration test in the identification of MCI patients who could develop dementia (Cochrane Database Syst Rev. 2015: CD010783). We have developed a new system (ALZENTIA) that helps detect early MCI, mainly caused by AD. This system consists of original software and hardware, and stems from the original efforts by the late Jan Bures and his colleagues to develop a hidden-goal task (HGT) test in which the human subject has to find a target that is not visible; instead, the navigation must be based on a previously memorized target position, in relation to the starting position and/or other navigational landmarks (orientation cues). The average duration of the test is approximately 25 min. per subject. Our preliminary results obtained on 91 healthy controls (HC) and 33 MCI patients have been recently published (J. Neurosci. Methods, 2020; 332: 108547). Receiver operating characteristic (ROC) analysis revealed that two measurements (variables) reached 85% or higher sensitivity and specificity: combined allocentric-egocentric average error of all 8 attempts, and egocentric average error of the first 4 attempts. The high NPVs (over 90% in almost all subtests and at all prevalences) suggested high discriminative capacity and diagnostic potential for the ALZENTIA system as a tool to detect subjects in healthy population who will progress to MCI. Considering the low sensitivity of the MMSE and Montreal Cognitive Assessment (MoCA) tests currently used for

this purpose, we believe that ALZENTIA can significantly improve early identification of MCI patients who will progress to AD. Funded by the Croatian Science Foundation and HAMAG-BICRO.

**A4-03****Genomic Diagnostics in Patients  
with Neurodegenerative Diseases**

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Neurodegenerative diseases are characterized by progressive nervous system dysfunction caused by the death of neurons in the brain and spinal cord. Given the prevalence, clinical hallmarks and associated costs of treatment, neurodegenerative diseases represent a significant and ever increasing public health problem. Despite extensive clinical research and dynamic developments in the field of neurology, especially regarding the development of new disease-modifying drugs and therapeutic procedures, there is still no effective medicine capable of stopping or even slowing neurodegenerative processes. A growing body of research points to the clear role of genetic mechanisms in the development of neurodegenerative diseases such as Alzheimer's and Parkinson's disease or Amyotrophic lateral sclerosis. Insight into the human genome structure provides key information on possible hereditary diseases and genetic rearrangements which can cause common and rare variants of the genotype. Although numerous genes are responsible for the appearance of monogenic forms of neurodegenerative diseases, in most cases, inheritance is genetically complex and occurs through the interaction of multiple genes and the environment. Genomic approaches, such as gene chips or next generation sequencing, provide a better insight into the genetic risk factors that are responsible for neurodegenerative diseases. Next generation sequencing approaches such as whole-genome, exome and panel sequencing have greatly enhanced our ability to detect genetic causes of neurodegenerative diseases. Novel genomic approaches will enable in the future not only the detection of new genetic risk variants, but will also contribute to increased treatment efficiency and reduce the frequency of adverse events to existing and future therapies.

## Poster presentations

### A4-P1

## Challenges in Headache Treatment in Elderly

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Headaches occur less frequently in the elderly than in the younger and middle-aged population, but are nevertheless a challenge for diagnosis and treatment. Any headache that first occurs in the elderly must arouse suspicion of a secondary headache and require diagnostic workup, including a brain imaging. In addition to primary and secondary brain tumors and intracranial haemorrhage, headache in the elderly may also be a consequence of systemic diseases such as arterial hypertension, polymyalgia rheumatica and giant cell arteritis, which also require treatment as soon as possible. Particular problems in older age are the primary headaches that continue since patient's young or middle-age, persistent in frequency and intensity. The treatment of such patients is a problem because of the comorbidities that limit pharmacotherapy, the limitations on the use of specific migraine drugs – triptans, polypragmasy and psychiatric comorbidities. The complexity of treating elderly patients with headache are best described by following case reports from everyday practice: 73 year-old female patient with trigeminal neuralgia, 77 year-old female patient with temporal arteritis, 90 year-old female patient with frequent tension-type headache, and 68 year-old male patient with chronic migraine. If left untreated, headaches significantly reduce the quality of life of elderly patients already burdened with other diseases and conditions and can lead to the occurrence of medication overuse headache.

### A4-P2

## Hallmarks of Corticogenesis After Ischemic Stroke in Mice

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**Introduction and objectives.** Stroke represents the most common acute neurological condition leading to permanent disability, and as such a significant burden of disease in a modern aging society. Animal models

of ischemic stroke mirror the postischemic changes at the molecular and cellular level, enabling the study of recovery mechanisms, that are presumably based on revoking the process of corticogenesis. The goal of this study was to identify the role of prominent markers of corticogenesis, SatB2 and Ctip2, in postischemic recovery. **Methods.** Transient middle cerebral artery occlusion (tMCAo) was performed on male adult C57Bl6 mice (n = 5) and the lesion was followed up using 7T BioSpec MRI system, as well as observing neurological deficit (NS) in the analysis of behaviour (Day 3, 7). Control group underwent the sham surgery. From Day 3 to 7 both groups received 5 dosages of 5-bromo-2'-deoxyuridine (BrdU) in order to mark the newly proliferating cells. On the day 7 mice were anaesthetized, perfused by saline and 4% paraformaldehyde (PFA) to preserve the brain anatomy for immunofluorescence (IF) using antibodies specific for SatB2, Ctip2, NeuN, cASP3, GFAP and BrdU. Slides were imaged using the confocal microscope (Olympus, CIBR) and positive cells were counted for each marker in the ipsilateral (IL) and contralateral (CL) cortex, hippocampus and striatum. Results were correlated to the lesion size determined by the MRI and cresyl-violet slides, and to the neurological score. **Results.** The lesion was the largest on the Day 3 after tMCAo, and this was in positive correlation with the ND. IF signal of SatB2 and Ctip2 was significantly different between the IL and CL hemispheres of the tMCAo mice, and in comparison to the sham operated group. Also, the amount of cells co-expressing both markers increased after tMCAo, as well as the number of BrdU positive cells. GFAP has shown an astrocytic reaction, while the total number of neurons (NeuN) was impaired in IL hemisphere after tMCAO. **Conclusions.** Subacute stage of ischemic stroke in mice includes increased proliferation of cells, as well as the changes in the neuronal cortical profiling (SatB2, Ctip2) that resemble immature patterns during corticogenesis. Modulation of those events could not only prevent the postischemic epileptogenic conversion, but also enhance the speed and quality of rehabilitation in affected patients.

**A4-P3****Effects of Age on Retinal Macrophage Responses to Acute Elevation of Intraocular Pressure**Jelena M. Kezić<sup>1,2,3</sup>, Vicki Chrysostomou<sup>2,4</sup>, Paul G. McMenamin<sup>3</sup>, Jonathan G. Crowston<sup>2,4</sup><sup>1</sup>Department of Histology and Embryology, School of Medicine, University of Zagreb, Zagreb, Croatia<sup>2</sup>Centre for Eye Research Australia, University of Melbourne, Royal Victorian Eye and Ear Hospital, Melbourne, Australia<sup>3</sup>Department of Anatomy and Developmental Biology, Monash University, Melbourne, Australia<sup>4</sup>Centre for Vision Research, Duke-NUS Medical School and Singapore Eye Research Institute, Singapore

**Introduction and objectives.** There is accumulating evidence that aging shifts the central nervous system milieu towards a proinflammatory state, with increased reactivity of microglia in the aging eye and brain having been implicated in the development of age-related neurodegenerative conditions. Indeed, alterations to microglial morphology and function have been recognized as a part of normal aging. Here, we sought to assess the effects of age on the retinal microglial and macrophage response to acute intraocular pressure (IOP) elevation and further, determine whether the age of bone marrow would alter the macrophage response to injury in bone marrow chimeric mice. **Methods.** For the first part of this study, C57BL/6J mice of 3 and 12 months of age underwent IOP elevation. Briefly, the anterior chamber was cannulated and intraocular pressure elevated to 50 mmHg for 30 minutes. Control eyes were cannulated and pressure was maintained at physiological IOP (12 mm Hg). In the second part of this study, bone marrow from young (8 week old) or middle-aged (12 month old) mice was used to reconstitute the bone marrow of whole-body irradiated 12 month old mice. Bone marrow chimeric mice underwent cannulation and IOP elevation 8 weeks after bone marrow transplantation. For both studies, eyes were collected for analysis 1 week after IOP elevation. Immunofluorescence staining was performed on retinal wholemounts to assess changes to the density of retinal macrophages, microglial process length and activation of glial cells. **Results.** Retinal macrophage reactivity and microglial morphological changes were enhanced in older mice when compared to younger mice in response to injury. When IOP elevation was performed after whole-body irradiation and bone marrow rescue, we noted a reduction in subretinal macrophage accumulation and attenuation of glial reactivity compared to non-irradiated mice that had also undergone IOP elevation. This effect was evident in both groups of chimeric mice that

had received either young or middle-aged bone marrow. **Conclusions.** Our data suggest irradiation itself may alter the macrophage and glial response to retinal injury rather than the age of bone marrow.

**A4-P4****Cognitive Training: New Therapeutic Approach to the Patients with Mild Cognitive Impairment**

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Cognitive training (CT) has attained attention as a non-pharmacological approach to maintain cognition in older adults. CT involves guided drill-and-practice on standardized tasks designed to load on specific cognitive processes, typically without explicit teaching of memory or problem-solving strategies. CT can target multiple domains and usually adapts task difficulty to individual performance. Recent randomized control trials and meta-analyses of experimental studies indicate positive effects of CT on the cognitive function of healthy older adults but also patients that demonstrate impaired cognitive functions due to several reasons. Furthermore, a large-scale randomized control trial with older adults, independent at entry, indicated that CT delayed their cognitive and functional decline over a five-year follow-up. This supports CT as a potentially efficient method to postpone cognitive decline in persons with mild cognitive impairment (MCI) and CT as therapeutic option able to prevent or delay cognitive or functional decline. Training in elderly with MCI had greater effect in the younger old and more cognitively preserved individuals. In MCI, CT is efficacious on global cognition, memory, working memory, and attention and helps improve psychosocial functioning, including depressive symptoms. Effect of CT was corroborated by a moderate effect size on common clinical measures of global cognition (mainly the Mini-Mental State Examination). Moderate effect sizes on memory is encouraging, as amnesic MCI profiles are at higher risk for dementia conversion. Participants in CT groups improved significantly over the intervention period but there are still insufficient data to determine whether training gains can be maintained over the long-term without further training. Cognitive interventions can contribute toward promoting health and independence among patients with MCI. Further investigations in large samples with long follow up pe-

riod are now warranted to verify the role of cognitive interventions as reliable tool to prevent cognitive functions and wellbeing.

#### A4-P5

### Role of Vibrational Spectroscopy in the Early Detection of Glaucoma

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**Introduction and objectives.** Glaucoma is a disease of the optic nerve that causes retinal ganglion cell (RGC) decay and retinal nerve fiber layer (RNFL) thinning, resulting in the visual field damage. It is one of the major causes of irreversible blindness in the world and is therefore a major public health problem since. Also, it is estimated that 80 million people will suffer from glaucoma by 2020. The most common type of glaucoma is primary open-angle glaucoma (POAG), and, despite numerous studies, the exact pathomechanism of its occurrence has not yet been determined. Numerous risk factors for the onset and progression of glaucoma have been identified, the most important being the height of intraocular pressure (IOP), the degree of damage at the time of diagnosis and the life expectancy of the patient. Currently, the only treatment option to slow the progression of the disease is to lower IOP. The goal is to detect glaucoma as early as possible to ensure the best possible quality of life and prevent blindness. Since there are currently no glaucoma-specific biomarkers yet identified and no glaucoma screening method available, we decided to analyze molecular structure of aqueous humor using FTIR spectroscopy which offers a unique opportunity to investigate the composition of unknown substances on a molecular basis. **Methods.** The study included 80 age matched subjects from the Reference Center for Glaucoma, UHC "Sestre milosrdnice", divided into two groups 1) 40 glaucoma patients and 2) a control group comprising 40 patients with cataracts. For the purpose of molecular analysis, all aqueous humor samples were collected at the start of the glaucoma or cataract surgery. FTIR spectra of the samples dried on transparent silicon windows were obtained in a transmission mode, followed by principal component analysis (PCA) modeling of the recorded spectra. **Results.** FTIR spectra with vibrational modes specific to glaucoma and cataract were examined. In the chemomet-

ric analysis of the spectroscopic data, all 40 (100%) of the cataract eyes were correctly diagnosed as the cataract group and all 40 (100%) glaucoma eyes were diagnosed as the glaucoma group, demonstrating a distinct correlation between studied eye diseases and their FTIR spectra. **Conclusions.** FTIR spectroscopy combined with the chemometrics has proven to be a promising method for molecular analysis of the aqueous humor as the differentiation between eyes with cataract and glaucoma has been achieved. Separation of the two groups of FTIR spectra in the created PCA statistical model also indicates that this method may have a promising role in the discovery of glaucoma biomarkers.

#### A4-P6

### BDNF, IL-6, PPAR $\gamma$ Gene and BDNF Protein Polymorphisms in Patients with Glaucoma

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**Introduction and objectives.** Glaucoma is a slowly progressive, chronic optic neuropathy that is characterized by retinal ganglion cell (RGC) death with subsequent loss of optic nerve axons and decrements in visual function. It is one of the major causes of irreversible blindness in the world and is a major public health problem. It is estimated that 80 million people will suffer from glaucoma by 2020. Several types of glaucoma are known, and the most frequent is primary open-angle glaucoma (POAG). Despite numerous studies, the exact pathomechanism of its occurrence has not yet been determined. Current treatment for glaucoma is directed toward lowering the IOP, but this approach only limits disease progression. The goal is to detect glaucoma as early as possible to ensure the best possible quality of life and prevent blindness. The molecular events responsible for glaucoma are currently poorly understood, complicating the design of therapies based on the underlying disease mechanisms. Since glaucoma is accompanied by profound biochemical changes, proteomic profiling or specific biomarker detection in the aqueous humor may be a way to follow glaucoma progression and potentially to monitor treatment efficacy. The aim of this study is to

analyze the concentration of BDNF in aqueous humor and serum and to identify polymorphisms of the BDNF, IL-6 and PPAR $\gamma$  genes. **Methods.** The study included 145 age matched subjects from the Reference Center for Glaucoma, UHC "Sestre milosrdnice", divided into two groups 1) 83 glaucoma patients and 2) a control group comprising 62 patients with cataracts. For the purpose of molecular analysis, all aqueous humor samples were collected at the start of glaucoma or cataract surgery. BDNF concentration was measured in aqueous humor and serum by ELISA method and BDNF polymorphism (Val66Met, VM), IL-6 (-174, GC) and PPAR $\gamma$  (Pro12Ala, CG) by PCR-RFLP. **Results.** BDNF concentration in serum and aqueous humor: glaucoma /cataract 13.0/13.9 ng/mL and 4.5/3.0 pg/mL. Polymorphism gene distribution (%): BDNF VV 61.4/58.1, VM 36.1/35.5, MM 2.4/6.5; IL-6 GG 38.9/41.9, GC 45.8/41.9, CC 13.3/16.1; PPAR $\gamma$  CC 75.9/74.2, CG 21.7/24.2, GG 2.4/1.6. **Conclusions.** Preliminary polymorphism results indicate possible polygenic markers of BDNF MM, IL-6 CC, and PPAR $\gamma$  GG and differences in aqueous humor BDNF concentration between examinee with glaucoma and cataract. Given the difference in the concentration of BDNF in aqueous humor between two groups, the potential for new treatment modalities opens. More research on a larger number of samples is needed to better understand the role of gene and polygenic markers in glaucoma.

chological, emotional and financial exhaustion. Family caregivers sometimes find it difficult to find a balance between work and family life, so they need help and support of the community which often doesn't understand the needs of patients and their families. A big issue is the late diagnosis of dementia, since the early symptoms of the disease are difficult to recognize. The project contributes to preventing the early institutionalization of patients, enables a better work-life balance for family members caring for patients, and increases the number of professionals working with patients. The Call Center will also support the whole community. The target groups of the project are people with Alzheimer's and other dementias, their families, the professionals who work with them as well as the general public.

#### A4-P7

### Lend a Hand Project

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Međimurje County

The project „Lend a hand“ solves the issue of social exclusion of people with Alzheimer's dementia and other forms of dementia in the Međimurje County, Krapina-Zagorje County, Požega-Slavonia County, Osijek-Baranja County and Koprivnica-Križevci County by improving the quality of life of the patients and their families. The purpose of the project is to include 30 Alzheimer affected persons into the community, therefore preventing their premature institutionalization. This will enable family members to reconcile between family and business life. This will be achieved during the 18 months the expert team will work daily with the patients. The general public will become more aware of Alzheimer's dementia and other forms of dementia through the Alzheimer cafe opening in 5 counties. Dementia, as a progressive and incurable illness, quickly leads to loss of independence and thus directly affects the families of patients, leading to physical, psy-

## Session A5: Good Clinical Practices for the Improvement of the Age Related Diseases

## Invited lecture

## A5-I

## Good Clinical Practices for the Improvement of the Age-Related Diseases

Alpana Mair

Scottish Government, Scotland, UK

The rise in the prevalence of multimorbidity (the co-occurrence of two or more chronic medical conditions in an individual person) in ageing societies is one of the greatest challenges now faced by health services internationally. Despite this, most medical research, guidelines, and contractual agreements (such as pay-for-performance initiatives) are focused on the management of single disease states. In these patients, individually treating each condition inevitably leads to the use of multiple medications (polypharmacy), the risks and benefits of which are largely unproven and often unpredictable.

It is important to note that polypharmacy is not inappropriate per se, and it is often beneficial. For example, effective secondary prevention of myocardial infarction requires the use of at least four different classes of drugs (antiplatelets, statins, angiotensin-converting enzyme inhibitors, and beta-blockers). However, polypharmacy becomes inappropriate when the risks of multiple medications begin to outweigh their potential benefits for an individual patient. The risk of harm is generally higher in older people with multimorbidity than in younger patients due to their reduced ability to clear drugs (e.g., due to renal and/or hepatic impairment) and increased vulnerability to drugs' adverse effects (due to general frailty and drug-drug and drug-disease interactions) and medication burden. However, the increased risk of harm is not always offset by increased benefits, and for many preventive medicines, such benefits may never be realized due to a shortened life expectancy.

There is mounting evidence that polypharmacy is a public health threat and a major source of unnecessary harm, greater use of health services, hospitalization, reduced quality of life, and substantial financial cost to health-care systems. In 2012, the US Institute for Healthcare Informatics estimated that inappropriate polypharmacy contributes to 4% of the avoidable costs of health care, equating to an expenditure of \$18 bil-

lion worldwide, and one recommendation was to support pharmacist collaboration with physicians for medication reviews. Up to 11% of unplanned hospital admissions in the UK are attributable to mostly avoidable harm from medicines, and of these, over 70% are in elderly patients on multiple medicines. There are, therefore, significant opportunities to reduce this burden by timely and effective interventions. If this was extrapolated across the EU, this would result in 8.6M admissions. Similarly, it has been found that medicine related visits accounted for 12.5% of attendances, the main causes being adverse drug reactions (ADR) and non-adherence to medicines (33% and 19% respectively). The EU SIMPATHY project, evaluated all the guidance documents that were available across the EU. The literature review identified that there are guidance documents available relating to the management of polypharmacy in only 3 of the 28 EU countries only the guidance documents from Scotland, Netherlands and Germany score the maximum on the AGREE II-GRS criteria for quality. The third edition of *Polypharmacy Guidance, Realistic Prescribing*, published in 2018, aims to provide guidance on preventing inappropriate polypharmacy at every stage of the patient journey. It contains a clear structure for both the initiation of new treatments and the review of existing treatments, and has been updated to place a greater emphasis on "what matters to the patient?" The 7 steps were informed by existing literature and initially agreed upon and subsequently refined (based on feedback from practicing clinicians and patients) by a guideline development group comprising a mix of pharmacists and primary (general practitioners) and secondary care physicians with backgrounds in clinical practice and academia.

Agreeing specific objectives with the patient in terms of both therapeutic objectives and current life priorities (step 1) sets the context within which all further decisions are made, namely on which medicines are essential (step 2) or unnecessary (step 3), whether therapeutic objectives that matter to the patient are achieved (step 4), which medicines are too risky or cause unacceptable adverse effects (step 5), which medicines are not cost effective (step 6), and whether the patient is willing and able to manage their medicines in a way that avoids harm and maximises benefit (step 7).

While guideline development is a necessary first step, improving patient outcomes relies on their effective implementation. The challenge of safely using multiple medicines for patients with multiple morbidities is beginning to gain international attention. In

## 7 STEPS TO APPROPRIATE POLYPHARMACY



April 2017, at the European launch of the SIMPATHY publication *Polypharmacy Management by 2030: A Patient Safety Challenge* (15), the Scottish Cabinet Secretary for Health called on the other 27 EU countries to take action on addressing polypharmacy, and this was also supported by WHO. This work has identified six key recommendations to implement programs to improve medication safety, of which polypharmacy is an essential element: (a) Use a systems approach that has multidisciplinary clinical and policy leadership; (b) nurture a culture that encourages and prioritizes the safety and quality of prescribing; (c) ensure that patients are integral to the decisions made about their medicines and are empowered and supported to do so; (d) use data to drive change and measure outcomes; (e) adopt an evidence-based approach with a bias to-

ward action; and (f) utilize, develop, and share tools to support implementation. The WHO Third Global Patient Safety Challenge (12), *Medication Without Harm*, has included the appropriate management of polypharmacy as a key flagship area to address across health care systems.

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## Oral presentations

### A5-O1

## Early Intervention Optimizes Long-Term Treatment Results in Patients with Inflammatory Rheumatic Diseases

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Rheumatic diseases are a prevalent group of entities with a significant impact on quality of life and morbidity in the population. Progress in rheumatology over the last 20 years has led to a significant increase in overall life and work prognosis. Rheumatoid arthritis (RA) decreases life expectancy by 10 years. Inadequately treated patients with active RA develop irreversible functional impairment in over 50%. Introduction of new drugs – biological and targeted synthetic agents – has changed treatment outcomes tremendously. In addition to the evolvement of therapy, new diagnostic algorithms have enabled early diagnosis. Adequate timing of contemporary treatment that is available in Croatia has led to prevention of disability, decline in sick leave, prolongation of time actively spent at work, as well as increased survival. Over 800 patients have been treated with targeted therapies at our institution – 650 are currently under treatment. Continuous and focused education of family physicians over the past 10 years enabled us to optimize screening of incident patients. The latter serves as a prerequisite for better treatment outcomes. Systemic lupus erythematosus (SLE) is a typical systemic inflammatory rheumatic disease. Five-year survival in the 1950s was 50%, in contrast to 95% at the beginning of this century. Data from the literature suggested a bimodal mortality pattern. Results of a study performed in Croatia demonstrated a 5-year survival of 90%. However, the study did not confirm a bimodal pattern: this may be explained by a decline in early mortality owing to early diagnosis and therapy, as well as by a lack of complications of aggressive therapy. This study demonstrated problems in the collection of public health data for patients with SLE. Insufficiency of the current criteria for SLE has resulted in a project within an international working group and, subsequently, proposal and publication of new criteria for the diagnosis of SLE (our Division was included as the Referral Center for SLE of the Croatian Ministry of Health). Progress has been noted in the diagnosis and treat-

ment of common rheumatic diseases of the elderly such as polymyalgia rheumatica and giant cell arteritis. Our experience in the use of contemporary therapeutics showed good results and better treatment tolerance. Finally, further steps have been noted in the treatment of osteoarthritis, commonly perceived as the most important rheumatic disease in the elderly. Improvement of surgical techniques and higher quality endoprostheses have increased treatment outcomes. Steps forward in the area of osteoarthritis pharmacotherapy have also been observed.

### A5-O2

## Pharmacogenomics – a Promising Tool for Elderly Patients on Polytherapy

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**Introduction and objectives.** Polypharmacy is prevalent in elderly patients and is associated with drug-drug interactions, adverse drug reactions (ADRs), more frequent hospital admissions and higher health-care costs. A pharmacogenomic approach enables personalized medication regimens based on individual genetic variations predominantly of ADME genes, involved in the pharmacokinetics of medicinal products. The majority of current pharmacogenomic decision support tools provide assessment only of single drug-gene interactions without taking into account complex drug-drug and drug-drug-gene interactions which are prevalent in polypharmacy and can result in ADRs or insufficient drug efficacy. Genotyping of metabolic enzymes of phase I (CYPs, DPD), phase II (TPMT, UGTs, NAT2), ABC, SLC transporters, and drug targets, represents a valuable tool for analysing the causal relationship between drug intake and dose related ADRs. The availability of genomic testing has grown, but its clinical application is still insufficient. The objective was to develop comprehensive pharmacogenomic decision support for medication risk assessment in elderly polymedicated patients. **Methods.** To study the

possible genetic associations with ADRs, School of Medicine University of Zagreb, University Hospital Centre Zagreb, and Croatian Agency for Medicinal Products & Medical Devices (HALMED) have piloted a project to collect DNA and phenotype data of ADR cases using international standardized phenotypic criteria. Patients with ADRs (N=860) and controls were genotyped for pharmacogenes. Univariate and multivariate prediction of ADRs were carried by means of binary logistic regression in order to identify novel associations or validate findings in cohorts of patients with well-defined phenotypes. **Results.** We developed a comprehensive knowledge repository of actionable pharmacogenes. HALMED developed a method for informing physicians or pharmacists and their patients about a possible pharmacogenetic involvement in the ADR pathogenesis. An anonymized copy of the test results has been used for the interpretation of possible signals. Several publications from this project have been published, depending on the medication in question (warfarin, statins, clopidogrel, methotrexate, AEDs, psychotropic drugs). **Conclusion.** Pharmacogenomic knowledge repository is an excellent starting point for pharmacogenomic testing implementation in clinical practice and pharmacogenetic counselling after a reported ADR. By using a pharmacogenomics approach, individualized strategies in medication can improve drug safety and efficacy in the elderly patient population.

### A5-O3

## International Networking and Clinical Practice in Neurodegenerative Diseases

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Aging is a well-known risk factor for neurodegenerative disease. As world population is continuously aging, both incidence and prevalence of neurodegenerative diseases are rising.

The term neurodegeneration means that there is an irreversible loss of neurons. Available treatments can only modify and slow down the natural course of the disease, but not stop disease progression. Therefore, it is not surprising that the field of research and interest in these diseases is continuously growing. Amyotrophic lateral sclerosis (ALS) is a neurodegenerative disease characterised by progressive loss of motor neurons leading to death in 3–5 years from symptom onset. Since there is still no cure, treatment is based on

a multidisciplinary approach in palliative care to improve the quality of life. To improve care and make expensive clinical research more available to our patients, Centre for Neuromuscular diseases and Clinical Electromyoneurography, Clinical hospital centre Zagreb became a member of ENCALS (European network to cure ALS) in 2017.

After joining the network, our Centre continued to provide up-to-date medical care, treatment and support for patients with ALS as well as actively seeking ways to contribute to the pool of knowledge about motor neuron disease. This is reflected in activities undertaken over the last two years – clinically based registry of ALS patients was created as well as blood and CSF bank. Registry provided up to date epidemiological data about Centre's patient population. We included new members into our multidisciplinary team with genomics and sleep disorders specialists. Following this team expansion first genetic testing results for Centre's patients with familial ALS are available. All of this enabled us to join TRICALS research initiative to find cure for ALS. Centre has also started validation and standardisation of the Croatian ECAS (Edinburgh Cognitive and Behavioural ALS screen) in collaboration with Prof. Abrahams' team from University of Edinburgh. Following this, same is intended with DAS (Dimensional Apathy Scale). Currently our Centre is exploring the quality of life of patients with ALS (first results pending). Considering all of the above it appears there has been a change in Centre's activity with increased productivity and improved structure, and change in team's attitude from mechanistic to optimistic which is sometimes even more difficult to achieve.

In this report we want to illustrate the practical importance of clinical and scientific network and its positive impact in everyday quality of clinical work in the demanding field of neurodegenerative diseases, especially ALS.

## Poster presentations

### A5-P1

## Common Clinical Challenges When Prescribing Dermatologic Therapy in Geriatric Patients

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One hundred years ago, only 2% of the U.S. population was over 65 years old. By 1980, this percentage was 11%, and by the year 2030, it will be 20%. With this tremendous increase in the proportion of elderly in the global population, geriatric medicine has become of great interest and importance. Data shows that around 40% of Americans between the ages of 65 and 74 years have had a skin disease significant enough to warrant treatment by a physician. Given the high incidence of significant dermatologic disorders in the elderly, it is clear that all health providers need to familiarize themselves with the diagnosis, prevention, and treatment of skin diseases seen in this population. The mainstay of therapeutic approach in the elderly should be proper skincare and treatment due to the preventable nature of most of the age-related skin diseases or treatable nature of another skin disease with their age-related specificities. Particular attention needs to be directed towards geriatric dermato-pharmacology as an ageing population has brought many therapeutic challenges that we need to recognize and overcome. Safely prescribing in the field of geriatric dermatology is a complicated task since there is an increased risk of drug interactions that may be caused by various factors including the prescribing factor, patient-related factors or difficulties within the health-care system such as poor or insufficient communication between the patients and medical professionals. Dermatologists and other specialists should be aware that prescribing medicines to their mature patients is a dynamic process that involves many patient-doctor-health-care providers' oriented steps, which may influence the therapeutic result. Also, they need to be aware of the age-related changes in the pharmacokinetics of common dermatologic drugs, their various interactions potentially occurring in the elderly, and the principles, and evidence-based strategies for their prevention, detection and management to improve adherence to therapy in order to ensure the best and the safest treatment of dermatoses occurring in the seniors. By implementing these gerontopharmacologic principles and strategies, and a team-based, holistic,

personalized, and multi-disciplinary professional dynamic approach we can achieve the desired therapeutic outcome and improved quality of life for this fragile group of patients.

### A5-P2

## Voice Disorders and Voice Therapy in Elderly

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**Introduction and Objectives.** Voice disorders in the elderly are usually the result of physiological changes in the larynx that result in poor voice quality, vocal fatigue, and vocal strain. However, part of the diagnosed voice disorders in this population is not due to aging. The aim of this paper is to present a clinical snapshot of such voice disorders – specifically the ones that accompany organic changes in the vocal cords – as well as to demonstrate the results of their rehabilitation. **Methods.** The study involved 23 women and 7 men aged 60 to 89 years with paralysis of the vocal cords caused by thyroidectomy (12), gastroesophageal reflux (LPR) (9), post-operative vagal glomus tumor (2), Reinke's edema (6) and vocal cord polyp (1). Their self-assessment of voice-related quality of life and their acoustic voice characteristics (jitter, shimmer, and harmonic-to-noise ratio) were compared before and after rehabilitation. **Results.** After rehabilitation, the acoustic parameters improved significantly, indicating that, regardless of patient age or the impact of functional dysphonia in the elderly population, a good rehabilitation procedure can evoke objectively measurable positive voice changes. Self-assessment revealed that poorer voice quality affects quality of life among these patients as well, even though they are no longer professionally involved or maximally socially active. **Conclusion.** The results of this study clearly demonstrate the need for the involvement of elderly persons in voice rehabilitation and the benefits of exploring various rehabilitation options in daily clinical work to raise or preserve their quality of life.

**A5-P3**

## The Person-Centred Medical Interview for Elderly Patients

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As in other medical branches, person-centered medical interview is an essential and very important tool when caring for the elderly. The medical interview is an integral part of the comprehensive geriatric assessment and diagnostic. The interview must include a complete range of biological, psychological, social and spiritual components. In communication with the elderly and the elderly patients, a special emphasis should be placed on certain challenges that highlight our communication skills, knowledge and personal views. It is essential to understand that older people will have to a much greater extent some functional difficulties that we need to be able to recognize and accommodate in the interview. One of the challenges in communication is certainly the issue how to convey various bad news to patients with serious diseases. When communicating with this type of patients, it is also important to recognize some of the specific emotional responses of old people to the disease. Finally, when we are talking about medical interview, it is of immense importance to organize the consultations with a whole family when we have an elderly patient with an illness. For medical practitioners, it is essential the knowledge how to conduct the interview which will have a high motivational effect on the patient and their health. The interview should be led in such a way to promote healthy aging – to point out the good parts and to encourage healthy life habits – while at the same time explaining to the patient that they can still live a quality life regardless the numerous illnesses. The geriatric assessment is interdisciplinary, requiring a high level of quality communication within the medical team. The patient and their family must be also a member of this team and equal participants in the communication process. Recognizing the importance of the above, we are pleased to have promoted and gradually introduced into the curriculum of the School of medicine University of Zagreb over the past ten years, the new modules dedicated to the communication with the elderly. In the teaching, we have included patients, too, through so called “model patient as a teacher”. This experiential learning method has proven to be excellent and has had the most impact on changing knowledge and attitudes among students and healthcare professionals. We believe that promoting healthy aging is a continuous process in which the improvement of communication is essential element.

**A5-P4**

## Stroke and Mechanical Thrombectomy in Elderly

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**Introduction.** The worldwide elderly population is rapidly growing, so absolute number of strokes is expected to significantly increase over the course of the next century. Therefore, the benefit of endovascular treatment (EVT) of stroke in the elderly becomes more relevant. Mechanical thrombectomy is an established treatment for acute ischemic stroke (AIS) due to a large vessel occlusion (LVO) involving the anterior cerebral circulation in all patients within 6 h and in some selected patients with advanced imaging findings up to 24 h from stroke onset. However, in most recent meta-analysis (HERMES), the older patients did worse than the younger patients regardless of treatment modality, and increasing age was a strong predictor of poor outcome. This single center analysis aimed to compare the outcomes of elderly patients with younger patients after EVT for AIS. **Methods.** We performed single center retrospective analysis of 60 patients (30 of them over 80 years and 30 under 80 years) who received EVT for anterior circulation in AIS. We aimed to determine 90-day good functional outcomes (modified Rankin Scale mRS 0–2) in patients  $\geq 80$  vs.  $< 80$  years, compare incidence of symptomatic intracranial hemorrhage (SICH), mortality and successful reperfusion rate (on TICI 0–2 scale) between groups. **Results.** Thirty two percent of our elderly cohort achieved good 90-day mRS outcome compared to 40% of younger patients. Successful reperfusion rate and SICH were similar (73% and 12% in younger group vs 76 % and 10% in elderly group). Morality was slightly higher in elderly group (22 % vs 17 %) which was most likely contributed to higher prestroke comorbidity. **Conclusion.** Our results support some of previous findings that although older patients may have worse outcomes overall, there is no heterogeneity of EVT effect seen by age. Mechanical thrombectomy is just as effective in elderly patients as it is in younger ones.

## A5-P5

## Different Faces of the Same Problem: Lipid-Lowering Therapy in the Elderly

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**Introduction and Objectives.** At least 85 million patients in Europe suffer from cardiovascular diseases which are the cause of 3,9 million deaths per year. Most of them are elderly people over 65 years old, who have an indication for lipid-lowering drug therapy. However, there is a question whether benefits of this treatment arises its harms considering frequent comorbidities in elderly population. **Methods.** Four types of patients that we meet daily in medical practice will be outlined. Their cardiovascular risk according to SCORE (Systematic Coronary Risk Estimation), patient assessment, blood pressure (BP), laboratory values: TC, HDL, LDL, eGFR and life expectancy, will be calculated. Given the calculated parameters and combined with an individual approach, decision of using lipid therapy will be made. **Results.** The first patient, female, 65 years old, BP 140/80 mmHg, TC 5.9 mmol/L, HDL 1.4 mmol/L, LDL 3.5 mmol/L, eGFR 89 mL/min/1.73m<sup>2</sup>, non-smoker. 10-year CV risk: 4%. This patient belongs to the moderate risk group (SCORE ≥1% and <5%) and her LDL values are 3.5 mmol/L with no indication for initiation of therapy (IIa/A). The second patient, male, 65 years old, BP 140/80 mmHg, TC 4.9 mmol/L, HDL 0.9 mmol/L, LDL 3.1 mmol/L, eGFR 65 mL/min/1.73m<sup>2</sup>, non-smoker. 10-year CV risk: 9%. This patient is in the high-risk group (SCORE ≥5% and <10%) and his LDL is 3.1 mmol/L, which means that therapy is recommended (I/A). The third patient, female, 80 years old, BP 150/90 mmHg, TC 6.9 mmol/L, HDL 0.7 mmol/L, LDL 4.5 mmol/L, eGFR 55 mL/min/1.73m<sup>2</sup>, smoker with documented ASCVD. This patient due to ASCVD belongs to the very high risk group and therapy is recommended (LDL goal <1.4mmol/L) (I/A). The fourth patient, male, 80 years old, BP 150/90 mmHg, TC 7.8 mmol/L, HDL 1.1 mmol/L, LDL 5.1 mmol/L, eGFR <30 mL/min/1.73m<sup>2</sup>, smoker with documented dementia and heart failure. Due to severe CKD (eGFR <30 mL/min/1.73m<sup>2</sup>), this patient belongs to the very high risk group, LDL is 5.1 mmol/L, which requires the gradual introduction of therapy at lower doses (I/C). Life expectancy is 3.3 years. **Conclusions.** According to the guidelines, particular attention should be paid to life expectancy and in some patients ap-

proach should be individual. In these cases, it is quite clear that it makes sense to introduce the therapy to the second and third patient, since their life expectancy is long enough for the therapy to reach its maximum effect, which takes 2–3 years. However, if the last case is looked at, the efficacy of the therapy depends on life expectancy and the dose should be modified depending on renal function and other comorbidities.

## A5-P6

## Therapeutic Options of Non-melanoma Skin Cancer in Elderly

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Non-melanoma skin cancer (NMSC) is the most common human cancer, with increasing incidence in the last decades. Cumulative sun exposure has the main role in the development of NMSC, so a higher prevalence of NMSC in the elderly is expected. A median age at diagnosis is 71 years. Of all NMSC, approximately 80% include basal cell carcinoma (BCC) and 20% squamous cell carcinoma (SCC). Other skin tumors account for about 1% of NMSC. In the elderly, therapy for NMSC can be surgical and nonsurgical. Surgical treatment of NMSC is the most effective treatment that provides high cure rate of over 90% for both SCC and BCC, and over 95% for BCC. Despite the high cure rates achieved with surgery, this treatment modality is associated with the risk of morbidities such as infections, which may be fatal in this age group. Other therapeutic modalities depend on tumor localization, histological type, and biologic behavior, as well as patient comorbidities, age, and life expectancy. Nonsurgical treatments include cryotherapy, local therapies (imiquimod, 5-fluorouracil, ingenol-mebutate, and diclofenac), photodynamic therapy, radiotherapy, and hedgehog inhibitors. Some of these treatments can be combined with curettage and electrodesiccation for better outcomes. Every treatment modality has advantages and disadvantages that must be carefully considered individually. Because the facial area is the most common localization of NMSC, treatment modalities with better cosmetic outcome are preferred. Many times, despite good clinical condition, a surgery is refused by the patient because of their age. Patient life expectancy, functional and socioeconomic status, and quality of life should be taken in consideration when choosing the most suitable treatment modality

for this non-fatal disease. Surgical excision after the procedure requires outpatient visits, which can be inconvenient because older patients are dependent on others because of the transport and a home care. On the other hand, nonsurgical treatments also require outpatient visits because of the novel applications which are sometimes unfamiliar to the patients. After choosing the best therapeutic option for a patient, it is crucial that the patient's quality of life is preserved in this sensitive age.

## A5-P7

# Characteristics of Multiple Sclerosis in Elderly Patients

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**Introduction.** Multiple sclerosis (MS) is an autoimmune chronic demyelinating disease of the central nervous system that usually starts between 20 and 40 years. Rarely, in about less than 10% , it starts after age 50. Currently, approximately a quarter of people with MS are mature adults over 65 years old. **Methods.** We have analyzed demographic characteristics of patients aged  $\geq 65$  years, clinical data including type of MS, age of disease onset, duration, Expanded Disability Status Scale (EDSS) and type of treatment. **Results.** Among 133 patients, 12 (9.02%) were  $\geq 65$  years old, 9 (75%) was female and 3 (25%) male. The youngest patient was 66 and the oldest 86 years old. The average age was 73.6 years. The average age of disease onset was 40.4 years, ranging between 25 and 63 years. The average disease duration was 33.2 years, range between 8 and 48 years. The most common type of disease was secondary progressive MS, present in 8 patients (66.7%), 2 (16.7%) patients had relapsing remitting MS and 2 (16.7%) primary progressive MS. The average EDSS was 4.5, range between 1 and 9. Most patients, 91.7%, received only symptomatic treatment, 1 patient took immunomodulatory drug. **Conclusion.** This small pilot study on characteristics of MS in elderly patients proved data found in the literature. As in the young age, female patients dominate. Longer disease duration means more frequent transition to secondary progressive MS and higher EDSS, while in the late onset of MS, after age of 50, primary progressive MS is more common. Immunomodulatory drugs, according to Croatian Health Organisation, until 2018 were reserved for patients younger than 55 years. Most patients in our study were treated only by symptomatic treatment, which could explain higher EDSS and progressive type of disease.

## A5-P8

# Outcomes and Patient Satisfaction in Women Undergoing Three Different Operating Techniques for Pelvic Organ Prolapse – a Pilot Study

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**Introduction and Objectives.** There are different methods for surgical management of pelvic organ prolapse. Surgical treatment includes vaginal native tissue repair, vaginal augmentation with mesh, and laparoscopic approach. The aim of this pilot study was to compare outcomes and patient satisfaction between three different operating techniques in a single hospital centre. **Methods.** A retrospective cohort study included total of 60 women who underwent surgery for apical and anterior prolapse. They were divided into three equal groups according to operating technique: vaginal native tissue repair (N=20), vaginal augmentation with mesh (N=20) and laparoscopic lateral suspension with mesh (N=20). Data collected included baseline patients characteristic (age, BMI, menopausal status, prior surgery), intra and perioperative variables (operative time, hospital stay, haemorrhage, wound infection, urinary complications) and six month follow up outcomes (recurrent prolapse, dyspareunia, de novo urinary incontinence or urgency, patient satisfaction calculated on scale 1–10). **Results.** Baseline characteristics of women included were similar. The mean operating time was significantly longer in the laparoscopic lateral suspension group (95 min) when compared with other two groups ( $p < 0.01$ ). Nevertheless, hospital stay was shorter in aforementioned group ( $p < 0.001$ ). Further perioperative complications were rare and comparable between the groups. During the six-month follow-up period, no prolapse recurrence and mesh erosion were observed in any group. De novo stress urinary incontinence and urgency were infrequently observed and comparable between the groups. Overall satisfaction was higher in laparoscopic lateral suspension group ( $p < 0.05$ ). **Conclusion.** No difference is found in complication rates and short-term outcomes between three different surgical techniques for apical and anterior prolapse. Nevertheless,

shorter hospital stay as well as higher overall satisfaction confirms laparoscopic lateral suspension as a promising endoscopic prolapse surgery technique. Future prospective studies with larger sample sizes demonstrating the long-term outcomes are warranted to confirm these conclusions.

#### A5-P9

### Osteoarthritis – Leading Cause of Disability in the Elderly

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**Introduction and objectives.** Osteoarthritis (OA) is a slowly progressive musculoskeletal disorder associated with increased age and is characterized by joint pain and tenderness, limitation of motion, joint deformity and instability. It has long been considered a noninflammatory process, but new insights suggest a role of proinflammatory mediators and proteases therefore enabling development of new treatment targets. **Methods.** Pathological findings in articular cartilage, bone, synovium and soft tissues of patients with OA are similar and vary in the degree of damage, suggesting a uniform response to various insults. Multiple risk factors for developing OA have been identified, including age, obesity, joint injury, genetics, gender, as well as anatomical factors. The pathogenesis of osteoarthritis involves various cytokines, chemokines and proteases and resembles that of a chronic nonhealing wound. There is growing evidence implying activation of the innate immune system as a result of tissue damage. Epigenetic changes contribute to development of OA as well and are being actively investigated. **Results.** Available treatment modalities consist of pain management but no treatment has been proven to alter the structural progression of the disease. Agents inhibiting catabolic processes and those stimulating anabolic processes, as well as drugs that modify inflammatory pathways and bone remodelling are being investigated and are referred to as disease-modifying OA drugs (DMOADs) or structure-modifying OA drugs (SMOADs). Investigational drugs targeting pain have focused on inhibiting nerve growth factor. **Conclusion.** Osteoarthritis is the most common form of arthritis. Since it affects mainly the elderly and is associated with substantial disability and reduced quality of life, it represents a great burden for the aging population. Novel insights into pathophysiology of the disease promise new treatment modalities, as opposed to current treatment targeting symptomatic relief.

#### A5-P10

### Therapeutic Movement Therapy (TMT) and the Healthy Lifestyles (HLS) Education in the Day Hospital (DH) – Reflections and Suggestions

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Therapeutic movement therapy (TMT) and the healthy life styles (HLS) education in the Day Hospital have been successful part of the program of the Day Hospital for the patients who suffer from depression, anxiety, grief, psychosomatic and stress related disorders, treated within this program. Patients who are treated are both sex, ages between 18–65, majority in the middle ages, with somatic diagnosis as comorbidity. Taking care of body helps to improve wellbeing. In this poster we will present patients' reflections and suggestions about this part of the program.

#### A5-P11

### Assessing Fitness to Work Among Older Workers: Literature Review

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**Introduction and Objectives.** Decreases in physical and mental functional ability due to aging can impair work capacity, productivity and fitness for work among older workers. There is no precise, generally recognized age at which someone is considered as an older worker. Some studies have focused on workers older than 55, while other studies examined those 45 years or older. It is vital to make appropriate fitness to work assessment of older workers due to serious increase of aged working population. Objective of our study is to summarise current situation in assessing fitness to work of older workers from data available in recent literature. **Methods.** Literature review has been made in PubMed database regarding following key words: ageing worker; fitness to work; functional capacity; work ability. We focused our search for time period of past 20 years. **Results.** We found only five publications that satisfied are inclusion criteria. All studies agreed that long-term health issues increase with age. At the same

time, mental and physical fitness are closely related and should be assessed together. Conclusion of fitness to work assessment is predisposed by the interface among functional capacity, health, the type of work, and options for work accommodation or change. In general, studies report that older workers exhibit lesser turnover, more commitment to the workplace, and have more positive work values. Absenteeism is less prevalent in relation to younger workers, although it is longer when it is caused by the injury or chronic illness. With respect to clinical and/or laboratory measurements, some authors have recommended the use of a 'work ability index' for specific occupations as a practical means of selecting the appropriate worker for the job. Such index has been made at Finnish Institute of Occupational Health as an instrument used in occupational health care and research to assess work ability of workers during health examinations and workplace surveys. **Conclusions.** Appropriate understanding of the work nature and workplace settings are essential for any fitness to work assessment among older workers. The assessment should include physical, mental and social capacity, as well as assessment of any disability. Occupational physicians have an important role in making longer working lifetimes as possible with productive and healthy older workers.

## A5-P12

### Is Ischemic Heart Disease as Huge Problem as We Think, or Is It Much Bigger?

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Ischemic heart disease (IHD) is a major cause of morbidity and mortality among elderly, as the age represents the strongest risk factor for development of the atherosclerotic changes along the arterial tree. Beside age, older patients are more exposed to many other known cardiovascular risk factors, especially arterial hypertension, diabetes mellitus, dyslipidemia, renal dysfunction, smoking etc. Many different studies have demonstrated a higher prevalence of advanced coronary artery disease (CAD) in elderly, like severe calcifications, obstructive lesions of coronary arteries, commonly affected left main coronary artery, multi-vessel disease etc. From epidemiological point of view, according to famous trials NHANES, FHS, CHS, men older than 80 years of age are more affected with CAD than women, who present more likely with chronic

coronary syndrome. Older patients often have atypical clinical presentation, and according to MESA and CHS trials one part of them have subclinical disease assessed by carotid intimal media thickness or coronary artery calcium. On the other hand, GRACE trial showed that elderly present more frequently with non-ST-segment elevation myocardial infarction (NSTEMI), and unstable angina (UA). Only 33% of elderly are revascularised after ACS, while according to CRUSADE trial approximately 40%. Prognosis of such patients is unfavourable due to higher incidence of mortality, which reaches up to 50% at 3 years follow up. In EuroHeart survey in hospital mortality for ACS for people older than 85 years of age is approximately 17%. ACS in elderly is more complicated with various conditions such as cardiogenic shock, heart failure, papillary muscle rupture, malignant ventricular tachyarrhythmias, heart blocks, etc. Eventually, older people are more prone to develop second type of myocardial infarction, most frequently due to anemia, respiratory failure, infections. To date, the major problem represents small number of older patients recruited in ACS trials. Large registries like GRACE, NRMI and CRUSADE involve just under 30 % of STEMI and approximately 40% of NSTEMI patients. Stated facts leave for the task on future trials to involve more elderly in their investigations, therefore pathophysiology, presentation and treatment can be better understood.

## A5-P13

### Depression and Quality of Life in Patients with Epilepsy – Single Centre Experience

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**Introduction and objectives.** Epilepsy is often associated with comorbid psychiatric illnesses and the most frequent of these, in around 40% of patients, is major depressive disorder. Compared to general population epidemiological studies show a consistent increased prevalence of depression in epilepsy. The main

aim of this study was to evaluate the relationship between epilepsy, antiepileptic drugs (AEDs) and depression. We also wanted to evaluate possible association between depressive symptoms in patients with epilepsy with the quality of life (QoL). **Methods.** This was a prospective cross-sectional study carried out at the tertiary teaching hospital (University Hospital Centre Zagreb, Croatia) with Ethics committee approval. Questionnaires evaluating depressive symptoms and QoL were administered to consecutive patients treated in the Referral Centre of the Ministry of Health of the Republic of Croatia for Epilepsy. Depressive symptoms were evaluated using Hamilton Rating Scale for Depression (HAM- D17). Quality of life was assessed using Quality of life in epilepsy-31 inventory (QOLIE-31). Statistical analysis was done using statistical software IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk, NY: IBM Corp, using t-test, one way ANOVA, post hoc Scheffe test, Bonferroni, Tukey test, and Pearson correlation coefficient. **Results.** 108 patients (63% women, 37% men; mean age  $39.54 \pm 15.91$  years) with epilepsy were included. 14.8% of patients had focal, 35.2% generalised and 40.7% both types of epilepsy. Majority of patients (65.74%) were on two and more AEDs and quarter was on monotherapy (25%); 42% were on newer, 19% on older and 39% on both AEDs. Mean total score on HAM- D17 was  $9.94 \pm 8.18$  (men – mean total score  $10.16 \pm 8.85$ , women – mean total score  $9.81 \pm 7.84$ ). There were no significant differences on HAM- D17 regarding gender and age. We didn't find statistically significant differences regarding AEDs (older vs. newer AEDs, or both types AEDs) and results on HAM- D17, nor between the type of epilepsy and results on HAM – D17. We found strong negative correlation between the higher QoL and HAM – D17 ( $p=0.000$ ). **Conclusions.** Results of this study evaluating depressive symptoms in patients with epilepsy demonstrate that our patients mainly experience mild depressive symptoms, with no significant differences on HAM- D17 regarding gender and age. Patients with epilepsy with less pronounced depressive symptoms were found to have higher QoL. We did not find statistically significant differences regarding the type of epilepsy and results on HAM – D17, nor between the AEDs (older vs. newer AEDs, or both types AEDs) and results on HAM- D17.

## A5-P14

# Immunosenescence and Stroke

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Aging is a complex phenomenon leading to numerous changes in the physiological systems of the body. Age-related diseases are closely related to age-induced immune dysfunction, by which reductions in the efficiency and specificity of the immune system are termed „immunosenescence“. Immunosenescence predispose aged individuals to development of cerebrovascular risk factors. In neuro intensive care units several neuro-related diseases including stroke are related to immunosenescence and neuroinflammation in the elderly. Profound systemic immunodepression occurs as early as 12 hours after ischemic stroke and may persist for several weeks. T lymphocytes are central to the development of a sustained inflammatory response. There is evidence that they accumulate in the post-ischemic brain within a few hours of reperfusion. Infectious complications, predominantly chest and urinary tract infections, occur in many stroke patients within the first days of the stroke. The development of an infection soon after the stroke is associated with worse outcome. The immune system is also a key player in central nervous system repair and maintenance that undergoes a profound remodeling process over the lifetime and has a major impact on individual's poststroke neurorehabilitation, survival and outcome. Several advanced countries with superaged societies face the new challenge of improving the long-term prognosis of stroke patients. A better understanding of the multiple biological phenomena leading to diseases via the immunosenescence associated with inflammation provides a powerful target for interventions to increase the healthspan of elderly subjects.

## A5-P15

# Preparing Life for Healthy Longevity

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Psychiatry, more than any other field of medicine, needs to view a person as a whole, recognizing and accepting every patient's individuality. A personalized approach is very important when working with patients of older age for multiple reasons: these patients

come to us with a lifetime of trauma, they not only have medical but also social issues, they are isolated and less functional, aside from psychological disorders, they also have somatic comorbidities and are generally more sensitive to pharmacotherapy. They are a particularly vulnerable group of patients in every way. This is why with these patients psychopharmaceuticals are prescribed very cautiously and various support therapy techniques are used, which includes stimulating patients towards a meaningful life. The importance of seeking meaning in life and positive attitudes towards life has been talked about since ancient times; Aristotle speaks of eudaimonia and resilience is a popular term today. For the past ten years research has been conducted on the impact that finding meaning in life has on a person's overall health and in reducing the risk of certain diseases, including dementia, stroke and heart attack, by increasing cognitive reserve and reducing the infection response. Frankl, the founder of logotherapy, states that a person's basic need is to search for purpose and that he/she is willing to suffer if that suffering has a purpose, that purpose in life (and in the moment) is individual and must be sought out daily on an individual level. Logotherapy, as a method of psychotherapy, encourages patients to look for strengths within them and then direct themselves towards meaningful action, which is the most satisfying when directed at others. An individual approach is emphasized; together with the patient, his/her strengths, talents and aspirations from youth are sought out and encouraged, focusing on identifying positive moments. By designing daily activities, especially those that restore the patient's sense of being needed by others, that they should not give up because of those around them (family members), a brighter perspective is created, symptoms of anxiety and depression are eliminated and dementia is slowed through cognitive skills training. This approach achieves the preventative and curative effect that is necessary in order to increase the quality of life of the elderly and to increase lifespan.

## A5-P16

# Current Approaches to the Prevention and Treatment of Age-Related Macular Degeneration

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Macular degeneration, also known as age-related macular degeneration (AMD or ARMD), is a degenerative ailment affecting the macula. It is defined by the presence of distinct clinical findings, including drusen and retinal pigment epithelium (RPE) changes, in the absence of another malady. Later stages of the disease are correlated with impairment of vision. AMD is multifactorial in aetiology where age and heredity have a central place in the disease occurrence. The recent epidemiological studies have shown that there are about 0.4% of people between 50 and 60, 0.7% of people between 60 to 70, 2.3% of those 70 to 80, and nearly 12% of people over 80 years old diagnosed with AMD. Furthermore, smoking and obesity are associated with a higher prevalence of the disease. Modern classification divides AMD into two main types: non-exudative (dry, non-neovascular) holding around 90% of diagnosed disease and exudative (wet, neovascular) associated with more prompt progression of sight loss. The disease is diagnosed by funduscopic examination where the presence of multiple drusen is frequent for early AMD. The drusen may appear confluent in intermediate AMD with significant pigment variations and pigment accumulation. Furthermore, the retinal pigment epithelium (RPE) often appears atrophic, with easier visualization of the underlying choroid vascular plexus. On the other hand, advanced exudative AMD appears with choroidal neovascularization, RPE elevation or haemorrhage. Further procedures such as fluorescein angiography, Amsler grid evaluation, ocular coherence tomography (OCT) of the retina and ocular coherence tomography angiography (OCTA) of the retina confirm the diagnosis of AMD. Disease management can be divided into prophylaxis and active treatment. The first focus on the prevention of the non-exudative AMD, whereas the active approach is more common for the exudative AMD. Preventive efforts include exercising, eating well, and not smoking. No remedy or treatment returns already lost vision. In the exudative form, anti-VEGF medication injected into the eye or less ordinarily laser coagulation or photodynamic therapy may decrease the disease progression. Antioxidants and minerals do not appear to be useful for prevention. However, dietary supplements may slow the progression of the disease itself. The

most recent disease control approach include subretinal stem cell transplantation and intravitreal injection of ciliary neurotrophic factor, steroid inserts and neuroprotective drugs, including brimonidine.

## A5-P17

# Why Care About Nutrition and Eating Habits in Early Life? Impact on Healthy Ageing

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**Introduction and objectives.** The rapid increase of non-communicable diseases (NCDs) is a major global health concern. The increase has happened too fast thus suggests that epigenetic phenomena may play a pivotal role. The most critical period in life is during the first 1000 days (from conception until 2 years) that offers a critical window of opportunity to shape both short and long-term health, while nutrition plays a crucial role. An imbalanced intake of nutrients can have profound effects on the child development, including risk of NCDs in later life. Meeting the specific nutritional needs in this period can positively influence health outcome throughout life and therefore represents the first step towards healthy aging. Feeding difficulties (FDs) are among the most common pediatric problems. Incidence is higher in children with psychomotor developmental disorders and chronic illnesses. According to some authors, 25–30% of parents report specific feeding problems, and 1–2% have serious problems classified as early feeding disorders (EFDs). This difficulty significantly increase the risk of malnutrition and can adversely affect healthy aging. The aim of this research was to analyze the characteristics of children with FDs in our department and applied therapeutic interventions. **Methods.** Medical chart retrospective analysis of children who attended department due to FDs in the past two-year. **Results.** During the analyzed period, a total of 174 children with nutrition-related disorders were treated (FDs and eating disorders). Fifty-seven, average age  $16.31 \pm 9.2$  months, had FDs. Only 6/47 had a severe form (EFDs), while rest had mild form of FDs. Most prevalent was selective form of FDs, and infantile anorexia the rarest. On average, the difficulties lasted for  $7.29 \pm 5.32$  month before treatment. Organic diseases were excluded (GERD, food allergy, celiac disease). 40/57 children presented with failure to thrive and 35/57 had signs of malnutrition. Regarding risk factors, 24/57 children had psychomotor development difficulties and 13/57

had perinatal complications. Therapeutic interventions implied parental reassurance, education on feeding patterns and nutritional supplementations. Only children with EFDs were included in further multidisciplinary treatment. **Conclusions.** Feeding difficulties are common in pediatric practice, but are not seen as a potentially serious problem that can have long-term health effects. When recognized early, the intervention is simple and significantly reduces the risk of malnutrition and the negative impact on healthy aging. Thus, timely recognition and intervention are an important goal, for families and health professionals.

## A5-P18

# Clinical Practices for Improvement of Psoriasis in Elderly

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Psoriasis is a systemic inflammatory disease of multifactorial etiology, in which an increased release of proinflammatory cytokines and activation of the immune system cause damage to various tissues and organs. It is a chronic disease affecting 2–3% of the population, characterized by inflammation and scaling of the skin, but not limited to it. Mild psoriasis is generally treated with topical therapy, while phototherapy, oral systemic medications or biologic therapy are treatment options for moderate to severe disease. Taking into account the chronic course of this disease and the continuing rise in life expectancy, the prevalence of psoriasis among the elderly will further increase, which makes management of psoriasis in the elderly an important health care problem.

Management of psoriasis in elderly patients may be challenging since they are often excluded from clinical trials, and the data regarding efficacy and safety in this population is lacking. Consequently, some dermatologists recommend only topical therapy and avoid prescribing systemic therapy, which may lead to inadequate treatment response in this population. Individualized treatment to each elderly patient should be provided due to possible drug-induced or aggravated psoriasis, higher prevalence of comorbidities, polypharmacy, adverse effects, self-care capability and quality of life.

Topical therapy is probably the safest option for treating elderly patients with psoriasis, although topical corticosteroids should be used with caution due to

the physiologic changes in older skin and a higher risk of cutaneous side effects. The physical limitations and dependence on caregivers should also be taken into account, as compliance may be reduced due to difficulty in applying topical agents. Due to a higher prevalence of hypertension and decreased renal and hepatic function in the elderly, special caution should be taken when prescribing conventional systemic therapy – methotrexate, cyclosporine, and acitretin. Biologic therapy is more often initiated in younger than in elderly patients, although it may be a safer option than

conventional systemic therapy in the elderly due to its high efficacy, a lower rate of adverse events, and lower frequency of hospital visits. Still, regular follow-up is necessary because of the increased risk of infections and malignancies.

Since psoriasis is becoming increasingly widespread in the elderly, it is surprising that studies regarding treatment efficacy and safety in the geriatric population are scarce. Further clinical research on treatment modalities in the elderly are needed, in order to improve management outcomes in this population.



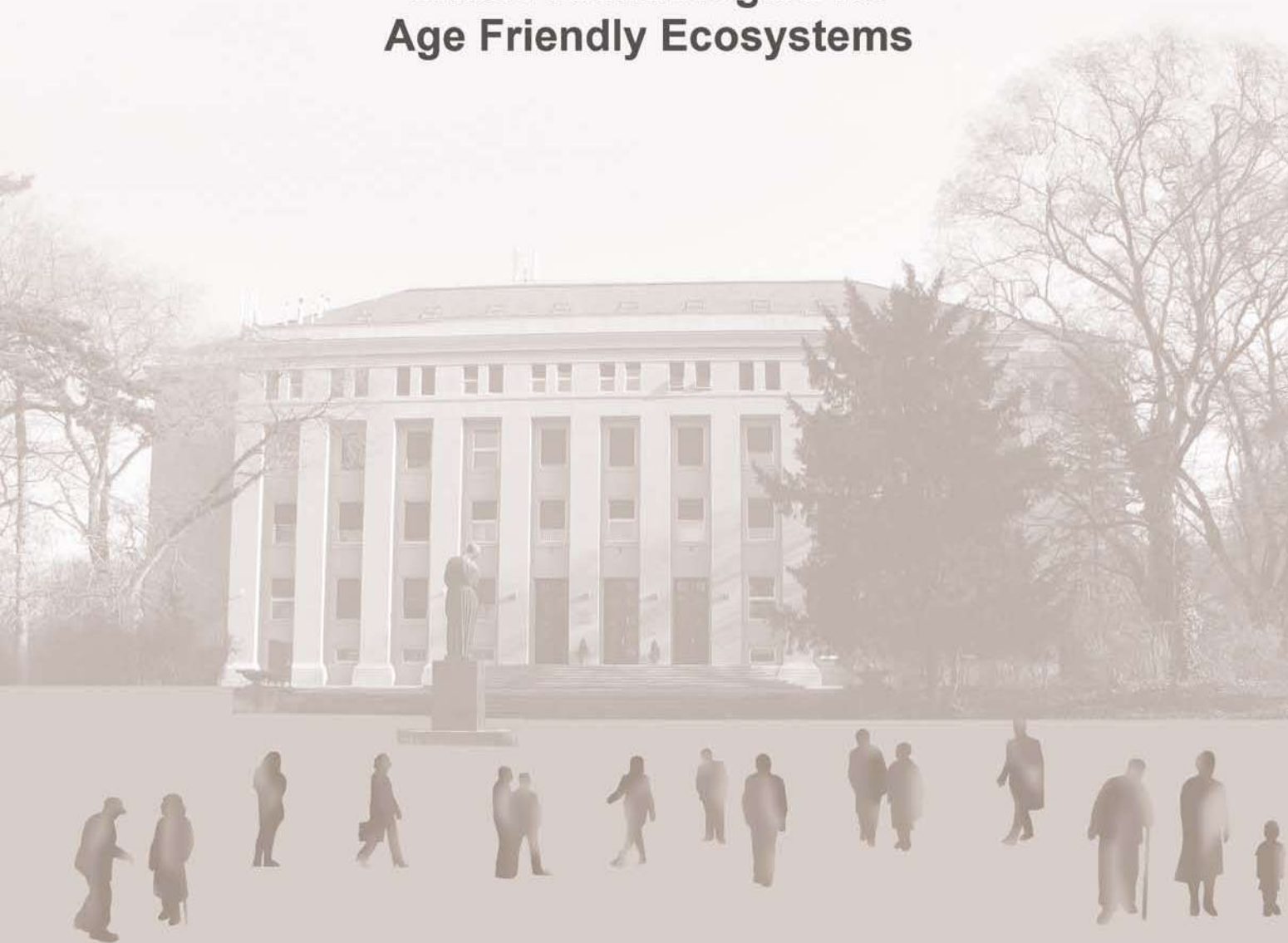


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BETTER FUTURE of HEALTHY AGEING 2020

Theme B

## Smart Technologies for Age Friendly Ecosystems





## Session B1: IT Technologies in the Service of Healthy Ageing

## Invited lecture

## B1-I

## IT Technologies in the Service of Healthy Ageing

Giuseppe Fico

Life Supporting Technologies, Spain

Throughout Europe and all around the world, mortality rates have fallen significantly over the past decades [1] leading to considerable changes in the age distribution of societies [2]. If these added years are dominated by rapid declines in physical and mental capacity without support, the implications for older people and for society are further more negative. Responding to the burden of ageing presents challenges for all health systems. More emphasis on the prevention of diseases and frailty states, on new ways to reorient the provision of care, is needed. Strategies that involve multiple organizational aspects, that are setting shared decision making processes in the community, and incorporate a multidisciplinary team approach are more likely to be effective [3]. Among the few models that have proved worldwide to be effective in implementing paradigm shift, the Chronic Care Model (CCM), and its adaptations and variations, is the mostly used by several regions to reform health care system with a long-term and 'big' plan, to use the full potential of a single-payer system [3]. The CCM is one of the few models that conceptualized effective components of care, even though these components have been not structured, and have not been well and formally articulated. "Consequently, there is limited evidence about the real impact of any of the existing models" [4]. Is it possible to improve the way evidence-based healthcare impacts our systems? In this context, innovations could support to achieve better diagnosis, treatment and management for patients across the continuum of care. Despite the exponential and astonishing advances in medical technologies 1, the way they are delivered is not sufficiently efficient, effective and consumer friendly. In a famous Harvard Business Review editorial, three types of innovations (technological, services and business) and six forces (players, funding, technology, customers, accountability) should be analysed in order to understand how to introduce

innovations to improve HC systems, mentioning that In Europe there are serious barriers towards adoption of customer-based innovations, technology-based are restricted and regulated by Health Technology Assessment agencies, due to cost expenditure maintenance, causing the absence of a large venture capital community; however, the centralized nature of European HC systems offers the potential for innovation in services for long term treatment and chronic diseases [5]. Nevertheless, technological innovations have proved to be the major contributor to the growth of countries in the last two centuries, especially when they have been part of common evolutionary trajectories and when they are grouped into paradigms [6], meaning that they are identified as "activities to solve problems that are selected by the paradigm itself" [7], acting as catalyst for innovations. Why this is not happening enough in the healthcare sector? The improvement of innovation delivery involves the creation of multidisciplinary research teams and taskforces, rather than just working teams [8]: multidisciplinary research involves "not only the integration of discipline-specific approaches, but also the extension of these to generate fundamentally new conceptual frameworks, hypotheses, theories, models, and methodological approaches that transcend their disciplinary origins" [9] and new challenges in evaluating the processes, outcomes, and skill acquisition of members of multi-disciplinary teams" [10]. Over the past decade, data scientists and engineers have become increasingly drawn to and involved with healthcare. This interest has recently been accelerated by the now near universal digitization of healthcare, providing data scientists with a toehold and a progressively important role in daily care as well as research. In the same period, the European 1 Stanford Medicine 2017 Health Trends Report. <http://med.stanford.edu/school/leadership/dean/healthtrends.html> Commission has been organizing a series of multidisciplinary activities to drive the adoption of innovations towards improvement of healthcare systems and outcomes, such as the European Innovation Partnership on Active and Healthy Ageing (EIPonAHA), the European Institute of Technology for Health (EIT-Health), the eHealth Action Plan 2012–2020, the Smart Living Environment for Ageing Well working group of the Alliance for Internet Of Things Initiative (AIOTI), the Study on Big Data in Public Health, Telemedicine and Healthcare. Despite all these huge efforts, no one is trying to "connect all the dots", and there is the risk that each one of these initiatives claims

to be holistic and breaking silos in a syncretistic manner. How can this group of diverse talents, interests, and schedules be brought together for productive collaboration? The digitization of healthcare provides data scientists with a toehold and a progressively important role in daily care as well as research. How can this group of diverse disciplines, sectors, talents, interests, and schedules be brought together for productive collaboration? The main objective of this speech is to show how effective implementation of healthcare interventions can be driven through structured adoption of innovation and technological paradigms, unbinding the potential of the synergies between these domains.

Four main research activities are proposed: 1. Translate Evidence-Based Healthcare (EBH) into actionable knowledge through eHealth paradigm wide and successful adoption of effective models of care is only possible when research findings can be translated. In order to transform knowledge and evidence into action, the way EBH is valued, synthesized, transferred and delivered is crucial. This means identifying a conceptualized model of care, and a suitable knowledge translation process, from discovery to intervention development, from development to delivery. The eHealth paradigm is currently used by the EC to improve efficiency of healthcare systems<sup>2</sup>. 2. Face the complexity of healthcare through multidisciplinary research and teams, empowered by the Internet of Things and Big Data paradigms: once concepts are defined, it is then possible to understand which domains and disciplines are (or can be) involved, in order to

better analyse the way effective interventions can be put in place. The Big Data and Internet of Things paradigms, sometimes seen as two sides of the same coin, would allow multidisciplinary teams to use data when it is still in motion, and extract valuable information from it, as a sort of knowledge in motion. 3. Turn knowledge and actions into Decision Support Systems, making use of Artificial Intelligence: once concepts, roles and knowledge are defined, it is possible to create intelligence systems through the AI paradigm. Rule inference and machine learning techniques can be used to create common and well-defined intelligent systems that could accelerate the innovation processes and provide recommendations to stakeholders and end-users. 4. Validate the DSS retrospectively and prospectively, and define new ways of assessing healthcare innovations throughout their whole life cycle. Once the DSS is developed, verifying how can support stakeholders and end-users of healthcare systems in taking better decisions and with which results, are fundamental activities. Understanding this means to define new ways of evaluating innovations in all aspects of healthcare (technologies, services, organizations).

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## Oral presentations

### B1-O1

## Not *the Computer* but *the Place*: Designing and Evaluating Future Ambient Spaces for Improved Quality of Life in the Elderly

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**Introduction and objectives.** In a set of related studies, we designed, implemented and evaluated ambient environments that support the wellbeing of elderly citizens: a) Exercise and health. Engaging in regular physical exercise improves not only physical wellbeing but also mental health problems such as depression and is a preventative factor in cognitive deterioration. b) Social engagement. Loneliness and social isolation are risk factors for elderly wellbeing. c) Experienced safety and privacy when using networked technologies. **Methods.** a) We designed and evaluated medically-recommended exercise programs based on sensing technologies in the user's home or in public spaces. In one study, outcomes in Spain and Sweden were compared. In another, exercise games with an added cognitive task were compared with similar games without. b) We designed and evaluated a range of interactive tools in the homes of users: a custom social network, ambient devices for signalling the arrival of messages or the need to communicate, and camera-based mood recognition. c) We are exploring attitudes to internet threats, such as phishing and counterfeit websites, using survey methods. We are also evaluating reactions to possible new ways of providing protection and assistance. **Results.** a) Physical exercise programs are popular with the elderly and effective for increasing levels of activity, but not motivating in themselves. Some commercial games are more entertaining, but do not provide medically-recommended exercises. Our designed games with approved movements were well-adopted, especially with an added problem-solving dimension. b) Social networking is popular with the elderly and can help reduce feelings of isolation. Ambient interaction devices can potentially be successful to facilitate background displays of a variety of information, such as arriving messages. Tangible objects provide a simple way of signalling a desire for contact from others, without the need to use a more complicated device. Camera-based facial expression recogni-

tion is effective for tracking mood change in the elderly, and can be used as a basis for automatic requests for assistance. c) Internet insecurity is a serious issue for the elderly, but can in principle be addressed with carefully designed intervening technologies. **Conclusions.** Technologically-enhanced ambient environments in the homes and meeting places of elderly users can facilitate and motivate healthy exercise, social interaction and to some extent allay concerns about safety and privacy while using internet-based services. We must provide the elderly with responsive spaces, not complex devices.

### B1-O2

## Potential of Accessible Website for Elderly – Case Study Research

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Digital accessibility refers to a website, mobile application or electronic document that can be easily navigated and understood by a wide range of users, including those who have visual, auditory, motor or cognitive disabilities. Properly designed web and mobile applications possess great potential for removing barriers to communication and interaction that many people face in the digital world and may significantly contribute to the well-being of particularly elderly by offering new possibilities and services not only for active participation in the society, but also for supporting living independently as long as possible. The “Accessible Website for Persons with Disabilities” project is a product of long multidisciplinary cooperation between the University of Zagreb FER and Croatian Regulatory Authority for Network Industries (HAKOM). The project includes several NGOs of persons with disabilities (PWD), students from technical field from Zagreb and Dubrovnik, middle-school students and elderly from retirement homes. The overall research goal is to analyze specific needs of PWD regarding web accessibility in the country and to implement open and innovative solutions for their digital inclusion. One of the results is the accessible web prototype ([usluge.ict-aac.hr/pristupacni-web-2](http://usluge.ict-aac.hr/pristupacni-web-2)) with the purpose of providing information on telecom operators' offers and benefits to young people, PWD and elderly. The prototype implements different accessibility features and presents the accompanied by corresponding method for developing accessible website that is distributed publicly to help developers and designers in their effort of accessible website development. Prototype evaluation was performed in several iterations

and representatives of elderly from retirement homes also took part in this process, the oldest participant was 89. Finally, total of 61.3% of respondents state that all accessibility options are fully implemented while 34.2% state that accessibility options are partly implemented. Part of the research performed in collaboration with the representatives of elderly focusing on those living in a nursing home shows that most of the elderly who use ICT need additional support mostly to communicate with the family and friends. This collaboration discovered new insights on what the elderly really expects the most from the digital world, as well as new ways of engaging students of technical studies in improving digital inclusion of elderly. So new course named “Application of technical knowledge for socially useful purposes” is starting at FER where students will apply their knowledge to provide support also for elderly.

### B1-O3

## Determining the Parameters of Healthy Ageing Using Automated Neuron-Level Analysis of the Laminar Structure of the Human Brain

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**Introduction and objectives.** The ageing of the human brain is protracted process characterized by the loss of neuronal elements such as synapses and neurons. One of the most common disorders of the brain in older age are various types of dementia. The hallmark of dementia is accelerated loss of neurons which leads to the loss of many cognitive functions. In order to determine the severity of neuronal loss in different types of dementia it is necessary to precisely quantify the number of neurons in different life periods and disorders. The goal of this research is the development of novel computational methods for automatic and objective analysis of human brain at neuron level in order to achieve objective estimation of parameters of healthy and pathological brain changes as result of ageing. **Methods.** Current golden standard in quantification is stereology for which, in order to produce reliable number, many criteria need to be met (e.g. section randomization, tissue sectioning, etc.). Even when all prerequisites of stereology have been met, the estimate produce by it can vary  $\pm 20\%$  from

real value. As many differences between “normal” and “pathological” brain fall within the 20% it is difficult to assess the real influence of neuronal loss in dementia. Machine learning methods based on tree ensembles and deep neural networks were used to estimate density of neuronal populations and predict neurons’ layer within the cortex. **Results.** In order to obtain more precise results about neuronal number in human brain we developed novel program for automatic cell counting, phenotyping and cortical layer segmentation. The proposed solution uses deep neural networks to reliably recognize all neurons on the histological slides. The advantage of such approach is the objectivity of counting (i.e. computer always recognize the same set of neurons), reduced estimate error (all neurons on the slide are counted instead of small proportion), and reduced influence of brain anisotropy (i.e. over or under representation due to the spatial tissue properties). Through performance measurements it was shown that the machine learning model’s output agrees with manual labels in the same amount as they agree with each other, thus creating results indistinguishable from that of human experts. **Conclusions.** Quantitative analysis of neuronal distribution and exploration of its underlying principles resulted in novel framework and methodology for cellular-level investigations of brain tissue. The use of our approach provides more reliable data about neuronal population during healthy ageing and thus providing better baseline for analysis of neuronal loss in many forms of dementia.

## Poster presentations

### B1-P1

## Smart Home – a Solution Compatible with the EU Home-Based Care Priority?

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**Introduction and objectives.** Population ageing has become one of the leading challenges of modern health care systems. Chronic patient care, which greatly refers to the elderly, represents an increasing burden for health care. Combining that approach with modern technological advances, smart home care solutions emerge. Solutions like these are based on IoT networking technologies, wireless integration of parameters received from sensors and automated data transfer. The aim was to analyse compatibility of the smart home care solutions' concept with EU home-based care priority, on the example of Croatia. **Methods.** SWOT analysis of the elderly smart home care model was conducted. It determines strengths, weaknesses, opportunities and threats regarding possible implementation of this model in Croatia. **Results.** Smart home care may support independent living and reduce burden on the health care system. It enables both formal and informal carers to provide more specific and more effective care. 24/7 monitoring improves care making home a setting for the reassurance of continuity and comprehensiveness of care. It respects patient-centred and patients as a partner approaches. The level of population and technology readiness for smart home care solutions is still relatively low and limited. At the moment, the most developed seem to be sensors for monitoring daily living and chronic health conditions. Integration into existing healthcare system is also a complex challenge. **Conclusion.** As the growing elderly population seeks to age at familiar settings, smart home technologies can be a potential solution to support home-based care while reducing chronic care burden on the health care systems. Remote monitoring and communication with carers via existing infrastructure could allow elderly patients to remain in their homes whilst still being cared for. Digital literacy, financial accessibility, immature technology, privacy loss and internet availability in remote/rural areas as the biggest downsides will need to be considered carefully. There is a clear need for a proof of evidence study to demonstrate the software integration possibilities.

### B1-P2

## Modern Technologies and Devices for Remote Health Monitoring in Elderly Healthcare

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**Introduction.** Increased life expectancy along with the decreasing birthrate globally will result in a large aging population in the near future. Older age is often accompanied by numerous chronic diseases such as cardiovascular and lung diseases, stroke, diabetes and cancer, causing high mortality and strong impact on quality of life such as long-term diabetes-related complications. This unfavorable trend creates a significant socio-economic burden and increases costs associated with health care services. Therefore, enabling affordable new strategies and technologies for providing better health care is urgently needed. Emergency situations in elderly require immediate medical interventions and can result in prolonged hospital stay, all of which could be avoided or prevented by the continuous monitoring of the physiological parameters and activities. Remote health monitoring options: Remote health monitoring offers real-time monitoring, collecting and analyzing of physiological data collected by un-obtrusive sensors in a way that doesn't interrupt daily activities of normal life. Smart home platforms allow people to remain in their home environment where physiological condition and motions are monitored by non-invasive low-cost sensors which are in communication with remote healthcare facilities. Additionally, modern smartphones are equipped with a number of sensors that can be used to measure several health parameters, analyze them, display on the phone and transmit to a distant healthcare facility. Quantitative assessment of cognitive and physical health, daily activities, gait patterns, and vital signs can be useful for early detection of a potential health problem. Diabetes monitoring: Diabetes-related complications cause kidney failure, lower limb amputations, and blindness. Optimal care for patients with diabetes often lack key health information necessary for tighter diabetes control which would result in more effective therapeutic strategy. That is the reason for a recent boost in the development of glucose sensors with effective continuous sensing technology. Additionally, the broad spectrum of artificial intelligence approaches for prevention, detection and treatment of diabetes are currently being developed in order to improve glucose control and reduce hypoglycemic episodes. **Conclusion.** The

primary purpose of remote health monitoring is to allow people to live uninterrupted and active lives with continuous surveillance of their physical well-being. The improvements in data storage and processing allow a low-cost solution for screening, early diagnosis and predictive algorithms development.

### B1-P3

## SEFAC App – Tool to Support a Better Health

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**Introduction and Objectives.** The expansion of novel technologies and ICT solutions can serve for the improvement of population health when used appropriately. The main challenge is digital literacy among population, especially older persons. Older persons can benefit by using new technologies and ICT solutions in many aspects (monitor of heart rate, activity time, calories, create and maintain social networks). The SEFAC project supports the population health with specifically developed ICT solution for the improvement of lifestyles in order to reduce the burden of major chronic diseases and to increase the sustainability of health systems. **Participants and Methods.** The SEFAC project is developed for the improvement of lifestyles of citizens (+50) that are involved in 7-week program based on the mindfulness approach. The participants were given the opportunity to use SEFAC App on their smartphones or tablets. The main goal of the SEFAC App was to enable participants to use SEFAC knowledge even after the face to face workshops ended. **Results.** The SEFAC app is available in English, Dutch, Italian and Croatian and it is a part of the implementation phase in four pilot sites of the

SEFAC project (Cornwall, Rotterdam, Treviso and Rijeka). The results of Rijeka pilot site implementation will be shown – creation of an user account, installing the App on the devices and showing features that SEFAC App offers (coaching and motivation, monitor nutrition and physical exercise, manage dietary/ physical activity goals, mindful bell, mindfulness practices) in order to prevent, delay, slow down or even reverse the progress of a chronic disease(s), in line with their personalized dietary and activity goals. **Conclusion.** The benefit that the SEFAC App offers is the possibility to empower users for pro-active self-health management making it an excellent tool for supporting and encouraging participants in a service of a healthy aging with novel technologies.

**Acknowledgement:** This research is part of the project ‘738202 / SEFAC’ which has received funding from the European Union’s Health Programme (2014-2020).

### B1-P4

## Information and Communication Technologies in Service of Improving and Maintaining Mental Health in Ageing Society

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**Introduction and Objectives.** Burdens of ageing like chronic diseases, cognitive and social problems may result in mental health issues. Information and Communication Technologies (ICT) might offer solution for this challenge. This review gives information regarding utilization of various ICT concepts in health care and everyday life of the elderly and how it may influence their mental health. **Methods.** PubMed database was used for literature assessment using following keywords: Information and Communication Technologies, telemedicine, Artificial Intelligence (AI), elderly, depression and mental health. Official websites of World Health Organization (WHO) and European Union (EU) were consulted as well. **Results.** ICT modalities like Ambient Assistive Living Technology (AALT) based on AI help elderly to be autonomous and live a physically and socially active life. Social isolation prevention may reduce the risk of depression in elderly. Several of the top 25 most influential EU-Funded ICT projects for Active and Healthy Ageing are developing cloud based cognitive training tools, fall prevention solutions, continuous care platforms and robotic systems with great potential as smart home assistance and as a part of social care for people

with dementia through loneliness and isolation prevention. Insomnia is a significant factor of mental health issues of the elderly. Internet-based cognitive behavioral therapy programs and sleep technologies for remote monitoring of CPAP machines rehabilitate elderly with insomnia and improve their mental health outcomes. Initial phases of Agile Co Creation for Robots and Ageing (ACCRA) project designed to be tested in mobility, daily life and socialization support recorder a good overall attitude towards robotic technology and a great interest by the elderly participant to be actively involved in the development of tools based on their needs. Furthermore, different modalities of assistive technology, telecare and telemedicine have shown to be beneficial for Alzheimer disease patients and their caregivers through avoiding stress and depression. However, there are articles that emphasize a concern about consumer health information technologies regarding patients with multiple chronic illnesses. Data they track (i.e. diet or glucose levels) could be emotionally charged and may lead to low adoption of such tools. **Conclusion.** Enthusiasm for ICT innovation adoption is increasing and there are different technologies that have shown to be beneficial for mental health outcomes of the elderly. Although there are concerns about adoption of some types of ICTs, future improvements might help ICT utilization in service of healthy ageing.

## B1-P5

# The Role of Standardized Diabetes Data Set in Improving the Quality of Care at Primary Care Level

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Diabetes has become a major public health problem last decades because of the high prevalence and consequences it has on individuals and society (1). The prevalence of diabetes is highest among adults over the age of 65 and a global increase in diabetes prevalence can partially be explained by the aging of the world's population (1, 2). Diabetes in older people also has numerous specificities in care and potential threats associated with treatment. To enable patients the highest possible quality of life in their third age, it is important to postpone the development of chronic complications of diabetes. Along with the chronic care model, that

could be achieved by implementing a standardized data set for diabetes monitoring, which has proven to be efficient in improving quality indicators (2-6). As a part of Chrodis + Joint Action, co-financed by the EU, the research on improving quality of care by using standardized diabetes data set (SDDS) was conducted. The intervention consisted of educating family physicians (FPs) about the diabetes registry and giving them feedback about their SDDS. Mixing methods approach (quantitative and qualitative) for acquiring data was used. Quantitative analyses enabled analyzing SDDS and availability of key quality indicators before and after the intervention. Semi-structured interviews have been used to get an in-depth insight into FPs' usage and attitudes towards SDDS. An average number of patients with fulfilled SDDS per FP increased by 52.30% from 20.2 before to 30.8 after the intervention. Significant changes in values of chosen diabetes quality indicators were not observed, because of a short period of post-education monitoring within the project. The output of qualitative part enabled better insight in data set usages and revealed the recommendations for improving SDDS and quality of care as follows: implementing albumin/creatinine index in laboratories on primary health care level, SDDS feedback to FPs, involving nurses in SDDS, reducing number of standardized data sets and number of indicators per data set, making their patient management software more user-friendly, and additional funding. FPs mostly have positive attitudes towards SDDS and they use it as reminders in regular monitoring of patients with diabetes. However, educating FPs about SDDS, and giving them feedback on their work, might further contribute to better monitoring of patients with diabetes. Other possible improvement areas which might additionally improve SDDS and quality of care are ensuring monitoring of major quality indicators, higher involvement of nurses, optimization of patient management software, and additional funding.

## Session B2: Modern Urban Planning in the Service of Healthy Ageing

## Invited lecture

## B2-I

Modern Urban Planning  
in the Service of Healthy Ageing

Julia Wadoux

AGE Platform Europe, Belgium

*“... healthy ageing is more than just the absence of disease. For most older people, the maintenance of functional ability has the highest importance. The greatest costs to society are not the expenditures made to foster this functional ability, but the benefits that might be missed if we fail to make the appropriate adaptations and investments. The recommended societal approach to population ageing, which includes the goal of building an age-friendly world, requires the transformation of health systems away from disease-based curative models and towards the provision of integrated care that is centred on the needs of older people.”*

*Dr. Margaret Chan, in WHO,  
World Report on Ageing and Health, 2015*

### Setting the scene: ageing and urbanisation

In its 2018 Ageing Report, the European Commission said it expects that the proportion of the EU's population aged 65 and up will rise from 19% to 29% by 2070, while the segment aged 80 and over will increase from 5% to 13%. At the same time, 80% of older people already live in urban areas.

Demographic shifts and urbanisation have created important challenges that need to be addressed to ensure a good quality of life for all generations, while reducing inequalities and combating social exclusion. As populations age, pressures and challenges on health and wellbeing both mount and shift and policy makers are increasingly concerned about the growing burden on health systems in general and long-term care in particular.

### Fostering healthy ageing through age-friendly environments

According to the World Health Organization (WHO), physical and social environments are the key determinants of whether people can remain healthy, independent and autonomous long into their old age.

There are eight domains where this comes into play: transportation; outdoor spaces and built environment; housing; community support and health services; civic participation and employment; social participation; respect and social inclusion; and information and communication.

Improving these domains will help make cities more age-friendly. Such environments allow everyone to grow and get older in better health and to remain active and autonomous for longer. This contributes to lowering the gap between life expectancy and healthy life expectancy, which remains about 15 years for men and 17 years for women (EU28 – Eurostat). This means we spend on average between 15 and 17 years of our later life with a disabling health condition.

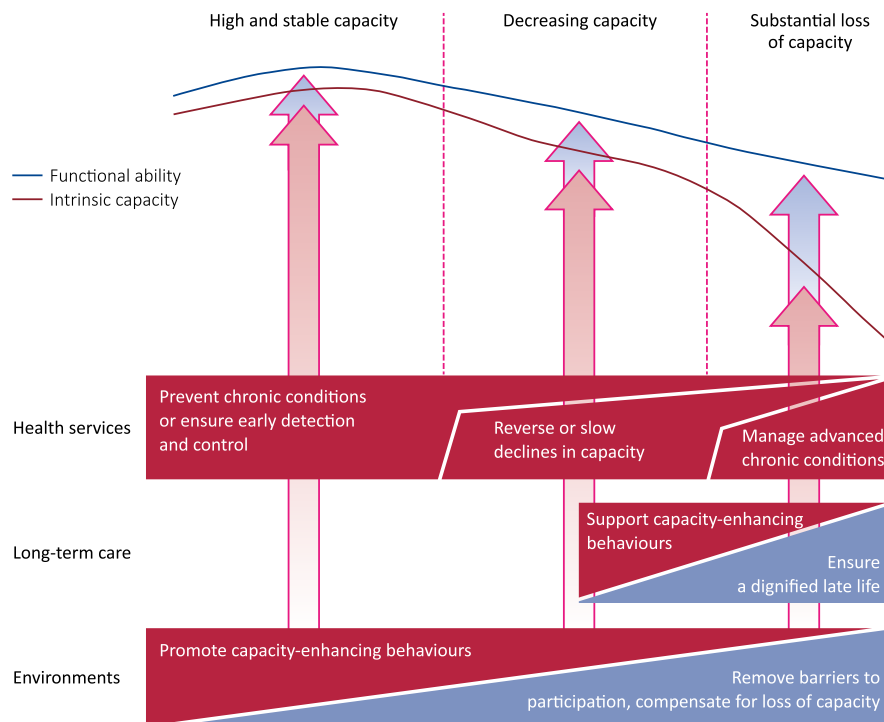
### Challenges faced by older persons in cities

Moving from a patient approach towards a citizenship narrative is therefore key to have a comprehensive approach of older people's life. While it is important to consider the access and availability of care and health services, this is not enough. There are several challenges older people face and which impact their health status:

- loneliness and isolation: according to recent findings of the Generations and Gender Survey, loneliness was common among 30% to 55% of older people in Central and Eastern Europe and 10% to 20% in Northwestern Europe;
- living in place: most people prefer to continue living in their own home and “the majority of older people will continue to prefer to live in communities with a mix of ages” (Buffel, Handler, Phillipson, 2018);
- social exclusion: while material deprivation is decreasing, inequalities are rising. This covers many different issues including the impact of gentrification in some urban centres as well as energy poverty;
- accessibility: is key to foster autonomy and enable a proper mobility and access to goods and services for everyone;
- ageism and negative stereotypes: they have harmful effects on the health of older adults; research shows that older adults with negative attitudes about ageing may live 7.5 years less than those with positive attitudes (Levy et al).

In a nutshell, urban planning can be a strong tool to enhance healthy ageing and “enable older people to be and to do what they value most” (WHO, 2020), this requires to:

- create a positive view on ageing so we all can look forward to a positive future in later life and move



Source: WHO, World Report on Ageing and Health, 2015

#### A PUBLIC-HEALTH FRAMEWORK FOR HEALTHY AGEING OPPORTUNITIES FOR PUBLIC-HEALTH ACTION ACROSS THE LIFE COURSE

from the emotional-alarming calls that a 'Silver Tsunami' is coming to an empathetic human-right based movement of society for all ages;

- build a narrative based citizenship approach: ageing is not only about a medical and care approach;
- enable active involvement citizens, including older persons, in the development and implementation of policies and activities in order to respect lifestyle choices, needs and preferences;
- organize and plan cities for persons of all ages: fostering solidarity between generations is key for a sustainable future;
- break the silos between the different municipality department and mainstream ageing issues;
- ensure a strong political support with a fair funding;
- develop an ecosystem enhancing close collaboration between various stakeholders (citizens, re-

searchers, policy makers, businesses): everyone has a role to play;

- provide a proper problem analysis, with meaningful data, and evaluation of the solutions implemented: this is key to learn lessons and move forward while ensuring continuity when needed.

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## Oral presentations

### B2-O1

## Social Design for Healthy Ageing

Ivana Fabrio

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Social design is a fast-growing field of design in recent years, tackling many issues across all facets of human life. Designers, who have traditionally been defined as problem solvers, have broadened their scope of impact towards developing systems and strategies as well as objects, serving the needs of undeserved communities. Therefore, students, who have grown in age of economically turbulent times are focusing their ambitions towards humanitarian work that helps solve complex social issues. These involve critical issues such as fragility of health, ageing, lack of natural resources or educational services and so on. Social design uses methods of participatory practice in collaboration with social enterprises, NGOs, foundations, corporations, and governments, with a goal to generate long-lasting solutions. Participatory design practice includes design research methodologies as well as participation of all the stakeholders throughout the whole process, from problem defining to solution and implementation. The methodology suggests a pattern of steps to define a problem, generating ideas and translating ideas into value. These processes include attributes of design thinking, that consist of five crucial phases, each aiming at human centered solutions, and including practices of ethnographic research and generative processes such as divergent thinking. The ideas are then tested through rapid prototyping and validated through a process of convergency to create consensus necessary from all stakeholders in order to execute a solution that results in real progress. The presentation will show step by step appropriation of this participatory methodology in social design projects that consider community members as partners in all aspects of the design process. The focus will be on projects that aim at empowering the ageing community through various approaches and solutions, focusing on intergenerational interactions and transactions that are materialized through urban, spatial and product solutions. Two projects will be shown as an example of social design aimed towards elderly population: 1. project LAND – is based on the daycare center that connects elderly people with kindergarten kids through a system of participating activities, that include architecture and product design as tools. LAND is a collaborative project between students of Architecture and School of Design and has won innovation

award at the International FINSA Award 2018. 2. project „Volunteers in the park“ - is a part of „Živjeti zdravo“ national program, which is a collaboration of six faculties within University of Zagreb, and was organized by The School of Public Health Andrija Štampar

### B2-O2

## Inclusive Design (for Ageing Population)

Sanja Bencetić

School of Design, Faculty of Architecture, University of Zagreb, Croatia

Global and local population ageing severely influence common image of average person, and traditional methods of addressing human needs through design. Contemporary principles and methods presented by inclusive design could answer these changes.

Basic inclusive design principles and methods are presented by review of four ground-breaking past projects. Following is the presentation of several original projects applying these principles and methods, with results, discussion and conclusion.

### B2-O3

## Green and Healthy Cities – Environmental Exposures and Urban Design for Healthy Longevity

Agnieszka Olszewska-Guizzo

NeuroLandscape Foundation, Singapore

In the face of ongoing urbanization and aging of the society, we can easily conclude that soon enough most older adults will live in urban environments. There is a consensus between the researchers and professionals that the urban living is stressful and can cause mental health issues, what is more, aging itself causes risk of developing mental health disorders. It is then necessary to investigate the spatial and environmental determinants of mental health and well-being in cities, targeting different age and social groups (from the antenatal to elderly phase of life). In this presentation I will discuss possible mechanisms of environmental exposures and mental health outcomes, with a focus on green spaces network within the city. I will present the current research status and gaps in knowledge to address the mental health issues, the limitations and

opportunities of evidence-based urban design, as well as the good examples from Europe and Asia.

## B2-O4

# Healthy Urban Planning for a Better Future for Healthy Ageing – Healthy Urban Planning, the Croatian Healthy Cities Network, and the City of Vinkovci (Croatia)

Mandica Sanković

City of Vinkovci, Croatia

Healthy urban planning is the attainment, preservation and improving health of all users of space through urban planning, urban planning, organization of the entire space of towns / settlements / cities. According to WHO terminology, healthy urban planning includes: urban planning, design, construction, supervision, maintenance. Urban planning is a multidisciplinary science related to: construction of new cities and settlements and study of their development, structures and life in the past, present and future. Urban planning as a multidisciplinary science includes: geography, economics, sociology, ecology, medicine, philosophy, law, transport and many other sciences. The principles of sound urban planning are based on the principles of healthy city: equality, social cohesion, multidisciplinary cooperation and community involvement. The impact of healthy urban planning is monitored through healthy urban planning indicators, which include 37 indicators in five areas: A-Health indicators, B-health indicators, C-environmental indicators, D-socioeconomic indicators and E-general data for the observed population. The Croatian Healthy Cities Network and the City of Vinkovci, through Vinkovci Healthy City project, implement measures aimed at improving population health by using, among other, healthy urban planning projects based on science. Improving health using healthy urban planning is very effective, but it demands holistic intersectoral work, education and political support. Healthy urban planning holistically determines activities for sustainable development, a better future, a healthy lifestyle from an early age, and creates the precondition for healthy and independent aging. The term and the activities related to healthy urban planning should be implemented into legal acts and at all phases of the whole process schooling and work. In that case, the implementation of healthy urban planning would be

mandatory and a sustainable development would become more attainable and sustainable development, healthy and independent aging more achievable. The Ottawa Charter on the Promotion of Health (1986), the Health for All Strategy, emphasizes the need to promote health, noting that only the health sector is responsible for the health of society. „Healthy city is a city for all its citizens, inclusive, supportive, socially sensitive, and capable of fulfilling different needs and expectations of its citizens”.

## Poster presentations

### B2-P1

## Urban Planning for Healthy Ageing: The Example of Park Planning in the City of Zagreb

Martina Jurjević<sup>1</sup>, Maja Lang Morović<sup>2</sup>,  
Sanja Musić Milanović<sup>2,3</sup>, Mirjana Kujundžić Tiljak<sup>4</sup>

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**Introduction and objectives.** Urban planning with the aim of health preservation and promotion is a rather novel technology. The literature on urban planning for healthy ageing is scarce. Still, within various national health promotion programs and projects, the need for urban planning for health in general and specifically, healthy ageing is continuously emphasized. According to the World Health Organization, by careful urban planning it is possible to support physically active lifestyles in people in their environments, increase the share of healthy population and establish spaces that enable healthy ageing. The goal of this paper is to present urban planning of one of the public surfaces in the City of Zagreb as an example of healthy ageing promotion. **Methods.** Residents of the Zagreb City center are in majority elderly and lack public spaces that would motivate them to go outside in the open more often, socialize and be more physically active. Due to the meaning and proximity of leading national public health institutions, the space at the beginning of Mirogojska Street with staircase leading towards Andrija Štampar School of Public Health and Croatian Institute of Public Health was selected to become a place where elderly people will be able to achieve some of the healthy ageing goals. This space however, was not used for years and has with time become unreachable posing a certain risk to the people. Architects in charge have projected this area to be the future meeting point in nature where people can be both physically active but also find their peace from everyday life while applying minimal interventions into the current architecture. **Results.** The healthy green city area was designed with minimal interventions. The impressive staircase was renewed. The plant

stock was kept to the fullest extent possible. The landscaping is dominated by publically lighted walking path at which end points there are places to sit, relax and socialize. The herb garden, dominated by lavender and rosemary, follows higher part of the trail. This way, the park also ensures an olfactory and visual sensory experience. An additional area of this park is a plateau designed to gather residents for events. The space next to the plateau has been left behind for the future monument of Slobodan Lang, a prominent physician and humanitarian, who spent his life working at both Andrija Štampar School of Public Health and Croatian Institute of Public Health. **Conclusion.** With multidisciplinary work for health and by taking people's health needs into account in urban planning, we can contribute to the rise of healthy people and promote, among other, healthy and quality ageing.

### B2-P2

## The Need for Early Evaluation of the Implementation of the Re-orientation Programme for Home Assistance Services to Ensure Its Sustainability

Jadranka Mustajbegović

WHO CC Occupational Health in Croatia, Croatia  
Croatian Academy of Medical Sciences, Croatia

**Introduction and Objectives.** The EU project Zaželi (engl. Wish ) of the Croatian Ministry of Labour and the Pension System is re-orientation training programme for women in the Home Assistance Service, an extra-institutional form of the protection of older people. It covering unemployed women over 50 years of age, who fall into the category of hard-to-employ workers and it is being implemented polycentrically in different parts of Croatia. The program lasts for 30 months and the first six months are scheduled for the education and training of women because they need to be educated to do these jobs. EUSUZ – The Centre for promotion of European standards in health care provides education and re-orientation training programme in Zagreb (Zaželi za Zagreb; engl. Wish for Zagreb). According to the criteria of occupational medicine, it is a sensitive group of female workers who are engaged in work with also very sensitive users of their services: the elderly who need help. The circumstances in which the home assistance services take place are very complex and demanding. Therefore, the objective was to recognize the most prominent organisational and psychosocial factors that arise from the above circumstances,

which can significantly jeopardize or even disable the achievement of the noble goals of this project. **Methods.** Based on first-hand experience in working with their customers, 54 trainees were asked: 1. List up to 3 interesting and enjoyable experiences with your customers; 2. List up to 3 of the most challenging problems you face when working with customers; 3. Do you think you need additional professional help to resolve any of the issues you have identified? **Results.** There are 3 groups of issues identified that require immediate intervention by those responsible for project implementation: hard physical effort- hard labour; users' wrong

perceptions of home assistance – what services they can expect; and considering the age of women who are in training- their working or health capacity are often reduced. **Conclusions.** To bridge the major challenges, the solutions can be: at the beginning bring the customer's household to a "zero" condition with a cleaning service – then the home assistance service can maintain afterwards; a written "agreement" with the customer and with the women in home assistance service; further training of women in home assistance service and their familiarisation with social security and health systems.

### Session B3: The Role of IT Companies in the Innovation Practices for Healthy Ageing

#### Invited lecture

##### B3-I

#### The Role of IT Companies in the Innovation Practices for Healthy Ageing

Rain Laane

Estonian Health Insurance Fund, Estonia

Abstract not sent.

#### Oral presentations

##### B3-O1

#### Health, Social and Financial Consequences of the Application of AI, ML and Digital Health – Going Far Beyond the Traditional Healthcare System

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We will employ the case of the ageing population to make an inquiry into the nature and causes of the transition of the healthcare system and health-related industries to the value-based healthcare model. The concept is based on the idea that purchasers of health care such as government, public and private employers, and individual consumers and single payers, multiple payers, individuals hold the health care delivery system accountable for the best possible quality of care. Increasing cost burden from chronic health conditions and aging population is the key driver for digital health solutions such as m-Health applications, RPM devices, telehealth platforms, and PERS. Furthermore, favorable reimbursement policies towards clinically relevant digital health applications. There are significantly expanding care delivery models beyond physical medicine to include behavioral health, wellness therapies, dentistry, nutrition, and prescription management – critical areas of care for the 65+ population. Healthcare is at a tipping point for leading tech

companies (Amazon, Apple, IBM, Google, and Microsoft) developing technologies suited for healthcare industry use cases. Applications for healthcare are gaining prominence as tech moguls are aggressively developing applications such as quick medical scribes and transcription speech-based guided interactions to vetted clinical use cases such as elderly care and chronic condition management. The key “tool/instrument” of transition is AI/ML across clinical and non-clinical arena bolstering the growth of healthcare space. AI/ML will begin to see fruition, particularly in the risk analytics applications for the aging population. The application of digital health will continue to go far beyond the traditional system and empower individuals to be able to manage their own health what is of critical importance for self-dependent aging population. It is expected that digital health tech catering to out of hospital settings, including services for the 65+ population will grow by 30% crossing \$25 billion markets globally. Application of AI/ML algorithms in healthy aging is highly dependent on data availability and integrity. Ericsson Nikola Tesla has developed solution “Smart Habits” for independent living of elderly people which by collecting information from sensors learns the patterns of daily living using ML algorithms and provides actions on behaviors different than usual. Integration of various data sources from activity to machine generated vital parameters readings in addition will serve as basis for prediction modeling in chronic disease management.

### B3-O2

## Humanoid Robots as Assistants in Healthy Ageing

Dora Matić, Ivan Bejić, Ivan Buterin, Zvonimir Jukić, Filip Kozlik, Vladimir Slošić, Ivan Hrabar, Frano Petrić, Zdenko Kovačić

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**Introduction and Objectives.** Medical practice worldwide is facing a problem with too few medical staff, given the growing number of older patients and their more demanding needs. Therefore, caregivers are often inaccessible, overworked, and patients are more at risk. To alleviate this problem, care systems based on the use of humanoid robots have been developed. We focus on using the characteristics of a humanoid robot to implement two demonstration scenarios: (i) demonstrator and supervisor of rehabilitation exercises for hands and arms, and (ii) medical assistant in a care-giving facility. **Methods.** We use the abilities of the robot to recognize humans’ faces and emotions, as well as the ability to communicate with smart devices (IoT-based) that offer better comfort and continuous moni-

toring of the health status of elderly patients. **Results.** Robot’s assistance to physiotherapists during execution of hand and arm rehabilitation exercises was implemented using NAO and Pepper humanoid robots. We have implemented a robot choreography for 18 exercises. While each exercise is in progress, the robot first explains to patients how an exercise should be performed, repeats those instructions and counts how many times an exercise has been repeated. It also talks to raise their motivation during exercising. The tests were done in the laboratory conditions and in the exercise rooms of the Clinical Hospital for Traumatology in Zagreb. The reactions of patients were very positive. During implementation of a medical assistant role, the focus was put on the interaction between the robot and the people around it, and the use of IoT devices had a goal to increase the quality of patient care. These new robot functionalities owing to the addition of IoT devices enabled the robot to perform the duties of a medical assistant more autonomously. This enabled the collection of patient status data (amount of sleep, physical activity, pulse). **Conclusions.** Assistive robotic technologies are recognized by the medical and care-giving community as being a strong support for healthy aging of the elderly population. They can help in slowing down the process of dementia, increasing the level of physical fitness and starting the process of becoming a social companion. One of the main benefits of using humanoid robots like Pepper is their ability to easily communicate with care-giving staff, which greatly speeds up the task. In addition to technical assistance to staff, the robot also offers social aspects of patient care. With its appearance and manner of communication, it can provide emotional support to patients and shortening their time through companion dialogue or play.

### B3-O3

## Simulating and Comparing the Effects of Preventive Programmes: An Application Example on Fall Risk Reduction

Sabato Mellone<sup>1</sup>, Pierpaolo Palumbo<sup>1</sup>, Beatrix Vereijken<sup>2</sup>, Jorunn L. Helbostad<sup>2</sup>, Lorenzo Chiai<sup>1</sup>

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**Introduction and Objectives.** Prolonged life expectancy and low birth rate is steadily increasing old age dependency ratio. In 2019, the ratio was 35.7% in Italy,

the highest value in Europe. Healthcare systems will have to shift, by force of circumstances, from treatment towards prevention of age-related medical conditions. Since falls in the elderly are a major cause of morbidity and mortality, fall risk assessment tools and intervention programmes are major research topics. Nevertheless, current guidelines for fall risk assessment have relatively low performance [1] and there are few properly validated risk screening methods. The PreventIT project developed and tested the feasibility of an ICT-based personalised behaviour change intervention for preventing functional decline at older age, targeting amongst others common risk factors for falls. Feasibility and cost estimates were assessed in a multicentre, three-armed randomised controlled trial [2], including a control group, a manual- plus instructor-based intervention (aLiFE), and a mobile health-based intervention (eLiFE). The aim of the current study is to simulate and compare the effects of the PreventIT interventions using the Italian situation. **Methods.** Starting from the simulation analysis reported in [1], we introduced: i) the statistics reported by the Italian National Institute of Health about prevalence, consequences, and related direct costs of falls; ii) the cost estimates for the PreventIT interventions. **Results.** Assuming the screening and intervention cost as direct cost of the healthcare service, the approach based on the simulation analysis in [1] would not be sustainable because of the poor performance of the risk screening tool and of costs associated with a traditional multifactorial intervention. Assuming the same efficacy for the intervention and state of the art predictivity for the risk screening tool, aLiFE would not be sustainable because of the costs associated with healthcare professionals and trainers involved in the intervention. In contrast, eLiFE, based on self-assessment and smartphone-based intervention, would be sustainable. **Conclusions.** Despite the limitations of this study, results emphasise the need to develop innovative solutions for empowering users to take care of their own health and function. The availability of effective digital tools, the integration with electronic healthcare records, and the integration with patient generated data will become crucial for the sustainability of healthcare services in the near future.

## Poster presentations

### B3-P1

## ICT Technologies as New Promising Tools for the Managing of Frailty: A Systematic Review

Alessia Gallucci<sup>1,2</sup>, Pietro Davide Trimarchi<sup>1</sup>, Carlo Abbate<sup>1</sup>, Cosimo Tuena<sup>3,4</sup>, Elisa Pedrolì<sup>3,5</sup>, Fabrizia Lattanzio<sup>6</sup>, Marco Stramba-Badiale<sup>7</sup>, Matteo Cesari<sup>8,9</sup>, Fabrizio Giunco<sup>1</sup>

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**Objectives.** Frailty associated with ageing is a major health issue as it encompasses functional decline, physical dependence and increased mortality risk. Recent studies explored Information and Communication Technology (ICT) as valid alternatives to manage frailty in elderly. The aim of the present review was to synthesize current evidence on ICT technologies application within the more complex assisting models of frailty in older people. **Design.** A systematic review of systematic reviews was conducted. Data sources included PubMed, Psychinfo, EMBASE and Web of science, considering eligible those reviews on ICT application in samples of elderly formally assessed as frail. Two independent researchers screened the records, extracted data and appraised methodological quality of reviews and studies. **Setting and Participants.** Frail elderly with a mean age of  $\geq 65$  years in any health care or residential setting, or community dwelling elderly people. **Results.** Among the 764 papers retrieved, we included 2 systematic reviews. Sixteen observational cross-sectional studies and one randomized control trial were analyzed across the systematic reviews. Most of the studies defined frailty considering only few components of the phenotype, and used ICT to stratify different levels of frailty or to support traditional screening strategies. Indeed, assessment of frailty is the setting in which ICT has been mostly tested as compared to intervention. Studies did not report cost

effectiveness evaluations of the ICT technologies employed. **Conclusions and Implications.** The research investigating the use of ICT in the context of frailty is still in its initial lines. Based on our results, there is no evidence supporting the ICT efficacy for the care of frailty, indeed ICT treatment strategies of frailty were

slightly reported. The lack of a proper characterization of the frail condition along with the methodological limitations prevented the investigation of ICT within complex assisting models of frail older people. Future studies are needed to effectively integrate ICT in the care of frailty.

## Session B4: Mobile Technologies and Primary Healthcare

### Invited lecture

#### B4-I

### Mobile Technologies and Primary Healthcare

Venet Osmani

Fondazione Bruno Kessler Research Institute, University of Trento, Italy

Life expectancy continues to increase owing to better quality of life and improved medical care. While the increase in life expectancy is an important achievement it tells only part of the story of the overall health of the population. Together with the life expectancy, the disease-free lifespan is also an important factor to be considered. Disease-free lifespan (known as healthspan) refers to the years of person's life spent in good health, free from the chronic diseases and disabilities of aging. However, there is some evidence to suggest that healthspan has not kept up with the increase in lifespan (1). Data from World Health Organisation shows that a global increase of 5 years in total life expectancy between 2000 and 2015 has been accompanied by only 4.6 years of healthy life expectancy (2). In fact, increasing life expectancy has increased the risk of chronic diseases including cardio-vascular, cancer and neurodegenerative diseases, where majority of these diseases are primarily manifested in older people. Considering socio-economic implications of this trend, there should be a focus shift from lifespan towards healthspan as the principal outcome and most important goal of medicine (3).

Research into extending healthspan has been tackled across diverse disciplines, from basic molecular and cellular mechanisms that drive ageing through to novel treatments and lifestyle interventions. While undoubtedly genetics play a major role there is also a vast potential for lifestyle interventions that could delay manifestation of chronic diseases and ageing-related disabilities. The focus of this work will be on the latter,

describing the potential of technological interventions in increasing healthspan. A particular focus will be put on the potential of mobile technologies to administer large-scale, personalised lifestyle interventions. This work will also provide an overview of the research in this area including a review of the EU initiatives in healthy ageing as well as research from individual research groups. The work will conclude with a presentation of the results from the projects and initiatives in healthy ageing carried out in the Trentino region in Italy.

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**Oral presentations****B4-O1****Set Up of an Ecosystem for the Digital Transformation of Health and Care: Campania Experience**

Maddalena Illario

Health's Innovation Unit, Campania Region, Naples, Italy

Campania is a region of southern Italy, with 5.801.692 residents (ISTAT, 2019) and a growing percentage of older adults from 14.3 (2002) to 18.8 (2019), with an ageing index of 129.8 and a dependency index of 49.9. Campania ageing population poses new challenges such as the need to switch from acute and reactive care to a proactive approach to health and to the integrated management of multiple chronic diseases, with the aim of reducing dependency and disability. Innovative, ICT-supported solutions conjugated with change management can speed up the process of change and improve the sustainability of Campania social and health system. The involvement of Campania in the European Innovation Partnership on Active and Healthy Ageing since 2013 has been stimulating and supporting the set-up of a local ecosystem to face the challenge of an ageing population with a lifecourse approach, where innovations are exploited to improve health outcomes, quality of life and sustainability of social and health services. The backbone of Campania RS has been developed according to the quadruple helix of the RS, and is rooted in the ProMIS@Campania network. It is connected to the national ProMIS network for the internationalization regional health services, and includes a referent for each one of the stakeholders of the regional health system. This core network has then been building structured connections along the 4 helix with: Universities and Research (Bioteknet District); No profit Organizations; Industry (Campania Digital Innovation Hub @Confindustria). Our ambition is connecting innovations with endusers by:

- Increasing health equity for Campania citizens by improving sustainability through change management strategies and large-scale adoption of ICT supported services, strengthening integrated care;
- Overcoming the boundaries of a system oriented to manage diseases, improving health promotion and disease prevention;
- Strengthening the transfer of biomedical and technological innovations to the market, exploiting the integration between research, training and service provision through international collaborations, for example through the EIP on AHA, the PPI and innovative procurement;
- Stimulating multidisciplinary and

multi-actor collaborations, through living labs that are designed to fit local socio-cultural contexts. To contribute in the achievement of these objectives, Campania RS has been supporting its stakeholders to join collaborative activities at locoregional, national and international levels along 4 main directories: Disease prevention & Health promotion; Integrated Care; Strategy and change management; New market opportunities.

**B4-O2****EU Project for Innovative Active and Healthy Ageing – City of Zagreb**

Antonija Balenović

Health Center Zagreb – Center, Croatia

Active and healthy aging and holistic care for the elderly has been one of the most important public health priorities of the City of Zagreb since 1987, when the City of Zagreb became part of the large European network of the World Health Organization “Healthy Cities”, which reflects the City’s commitment to improving all policies that contribute improving health and social well-being, especially for vulnerable groups of citizens. Based on the results of a long-standing policy and overall care for the elderly, the City of Zagreb during 2016 joined European Innovation Partnership for Active and Healthy Aging (EIP on AHA), which represents a network of EU Regions promoting active and healthy aging. During 2019 the accreditation process was reiterated and the Health Center Zagreb-Center as holder and the City of Zagreb as a region confirmed the status of the Reference Site and upgraded it from one to three stars, indicating the status given to those organizations and regions that have shown excellence in development in the previous period and adopting innovative practices for active and healthy aging. This platform is a communication and information hub for all actors involved in Active and Healthy Ageing through Europe. It is the place to encourage partner engagement, promote news and events, meet and exchange ideas with peers, and look for potential partners on innovative projects. Only cooperation can lead to structural changes that go beyond the scope that an individual organization could achieve on its own, thus helping to create an environment for learning, sharing knowledge and adapting to the capabilities and realities of different regions. The improvement of the digital innovation system and the use of digital tools is an area of development that needs to be invested since there is a significant increase in the proportion of older people with multiple chronic conditions in the City of Zagreb. Digital tools and ICT also can be helpful in

adherence to medical plans of older people living with chronic conditions and improve the quality of life and health outcomes by delivering tangible adherence approaches for patients in various disease areas. Our actions are based on a holistic approach, including enhanced self-care, personalized care, better adequacy of treatment and increased adherence to safe and effective care plans. Innovative organizational, technical and medical practices for better adherence can lead to more efficient use of resources and the efficiency of health interventions. Ultimately, it can improve the health of patients, their quality of life, reduce the worsening of the disease and avoid unnecessary hospitalizations.

### B4-O3

## Bridging the Digital Divide – ICT for Older People in Rijeka

Jadran Mandekić

Department of Health and Social Welfare, Rijeka, Croatia

The population of Rijeka is demographically quite old. A negative population growth has been recorded over the past 20 years, while the effects of the economic crisis drove a lot of young people to leave the country. This is one of the reasons why fostering a healthy ageing environment and keeping people healthy and active as they age is at the top of Rijeka's priorities. The importance of ICT technology as an effective social engagement tool cannot be understated in today's world. This fact was clear to the City of Rijeka and so the City's Department of Health and Social Welfare and the Information Technology Department started a series of activities that jointly became known as "A society in which I am learning and feeling good". To help bridge the digital divide, in 2005 Rijeka started providing free yearly ICT courses for older people. The courses are aimed at teaching basic and advanced IT skills. Rijeka is continuously financially and logistically supporting the operation and activities of 16 Clubs for Older People. The Clubs provide an opportunity for socialization and participation in many organized and free activities. As the level of digital literacy of older people of Rijeka grew, the City started creating small Digital Centers in the Clubs and equipping them with PCs, free Internet access and other ICT equipment. In order to motivate older people to use their newfound ICT knowledge and to encourage greater social participation, the City of Rijeka created a website aimed at older people (<http://penzici.rijeka.hr>), where the majority of content is created by the users themselves. To encourage greater activity on the por-

tal, a yearly "Top Online Pensioners" competition was organized. While it is challenging to properly motivate older people to engage in new activities and expand their comfort zone, Rijeka has learned that through education, proper means of motivation and citizen participation, older people are not only willing to participate, but are also very involved in creating new opportunities for themselves and their peers. This is noticeable through increased traffic on the website, more visits to the Clubs for older people, as well as greater overall participation in offered activities. Healthy ageing and the creation of a healthy ageing environment plays a large role in reaching many Sustainable Development Goals and therefore Rijeka is going to continue to focus its efforts in this direction.

## Poster presentations

No posters

**Session B5: Computer Technologies in Healthcare System, Organisation and Healthy Ageing****Invited lecture****B5-I****Intelligent and Explainable  
Shareable Clinical Pathways**

David Mendes

Universidade de Évora, Portugal

Population ageing poses challenges to societies never equated. In fact, as a result of the lifepath of the current elderly, they are aging with high loads of disease in the form of multimorbidity and dependence. Such circumstances induce a high consumption of care, a huge pressure on the health and social safety system and, at the same time, an urgent need to change the organizational models of provision and care due to the adjustment to the previous circumstances. We propose that AI (Artificial Intelligence) comes to the rescue. In order to enable automated clinical reasoning (aCR) both an innovative care model and a supporting infrastructure must be developed and put in place.

The proposed care contract entails all the levels of care from self to highly specialized care and can be pictured like this:

We are presenting a knowledge infrastructure to enable the aCR in a timely and responsive manner. The knowledge base is a “Digital twin” of the health and care conditions throughout the lifespan that has some aspects specific for our model representation.<sup>2</sup> Namely, two very important and distinctive characteristics that look obvious to any clinician but are not evident for any IT implementer:

1. It maintains a **two-fold time series** for representing the health and care history and events: It has both a *historical* and a “*current events*” time series and both are considered for the aCR to be performed accurately. In the first all the health condition antecedents are collected by a forefront running agent when the personal process is created and several and distinctive knowledge sources are used from the different institutions involved in our blockchain network. In the second a continuous stream of events are monitored for the adequate response generation and knowledge structure enrichment coming from the sensors available in the ALIE (Assisted Living Intelligent Environment).
2. A carefully crafted information fusion layer: The sensors that continuously gather vital signs information are low powered artifacts that function in the edge computing layer, very close to the person, but they must have some reasoning abilities. They provide features to the (automat-

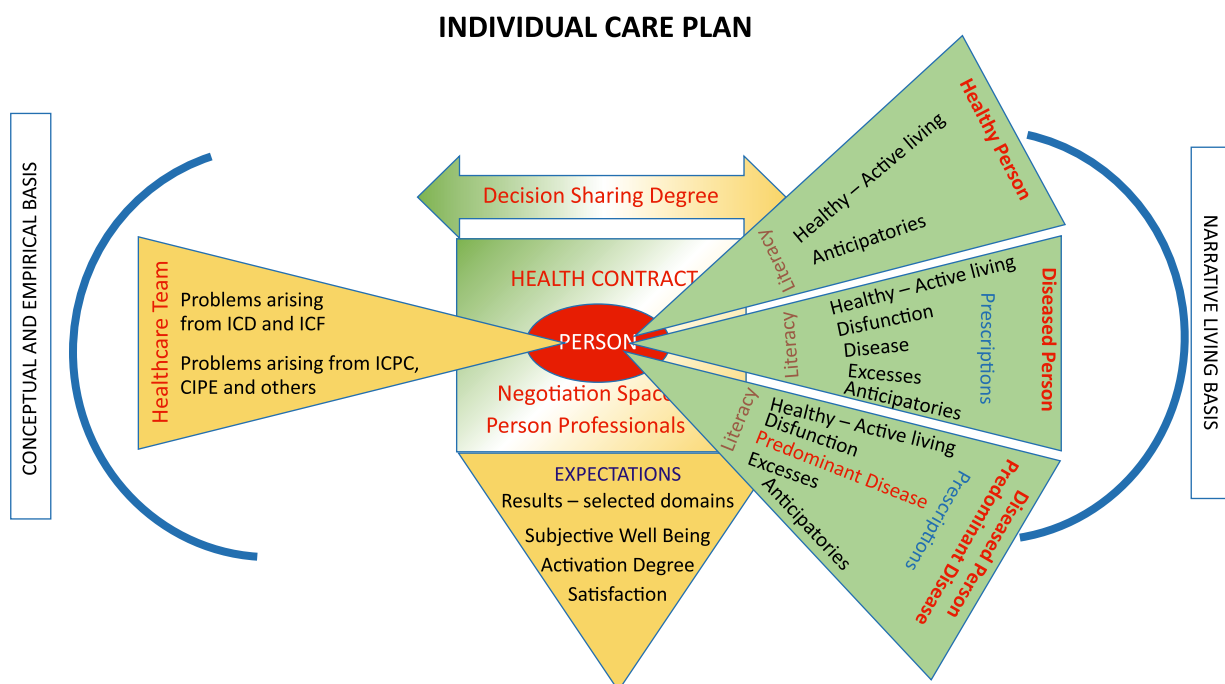


FIGURE 1. INDIVIDUAL CARE PLAN

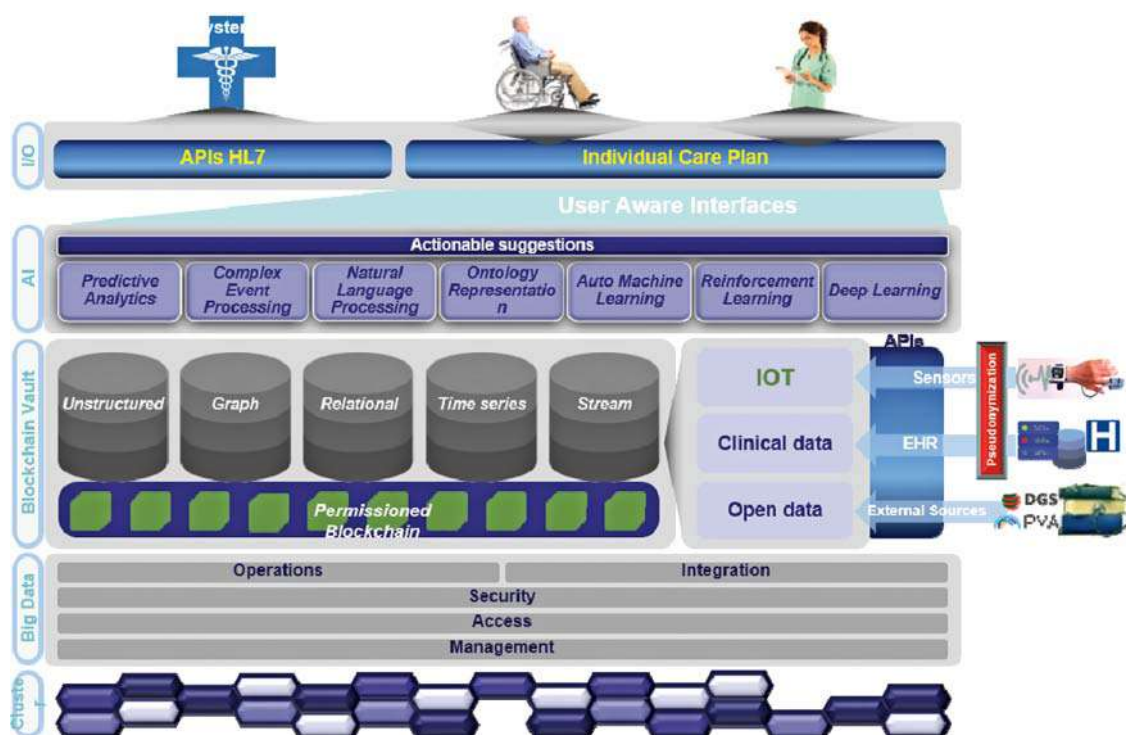


FIGURE 2. ALIE INFRASTRUCTURE

ed) Machine Learning processes that must be cleansed and directed for the most effective reasoning layer possible. An extreme example would be if a heart beating controller detects no beats it must, as quickly as possible, check if it is well positioned, battery in good condition, perform a double third party checking using an alternative life checker and if proven that the heart has possibly collapsed, activate the emergency services. This is all to be performed by the intelligence in the edge.

### IT structure in place

To develop all the system for specific ALIEs in the currently globally most important multimorbidity conditions (OCPD, Diabetes and Coronary Chronic Disease), while maintaining the highest levels of information security and patient safety, we propose a multilayered system of systems depicted in the following diagram:

### Interactive session

We will be demonstrating a conversational bot based in, an intelligent healthcare assistant, part of the **User Aware Interfaces**, that will activate a spoken dialogue in response of a possibly critical health event, a hypoglycemic alert, simulated in an ALIE where a diabetic person is monitored.<sup>3</sup> We intend to show how the most recent technology of **natural interfaces** render a much

more interesting way of interaction with the real world for increased healthcare providing value.

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## Oral presentations

### B5-O1

## Interprofessional Educational Intervention in Dementia Care

Alexander Kurz<sup>1</sup>, Lea Pfaeffel<sup>1</sup>, Marina Boban<sup>2</sup>

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In many countries of South Eastern Europe the quality of care for people with dementia and their families falls short of international standards. There is a lack of dementia-related knowledge and skills among health and social professionals, poor cooperation and coordination, as well as a shortage of important services such as day care centres or specialised nursing home units. Education of key occupational groups is considered to be key for improving dementia care and enhancing the quality of life of people with dementia and their informal carers. In 2017, dementia experts from ten South Eastern European countries teamed up with policy makers and businesses to create an educational intervention that simultaneously addresses multiple professions involved in dementia care. The intervention is unique in providing a common base of knowledge, a groundwork for understanding and collaboration, and a set of shared values in terms of a person-centred and holistic concept of dementia care. The intervention is in line with medical guidelines and complements existing or emerging national dementia strategies in the countries involved. It is delivered in a blended-learning format including traditional workshop materials and an e-learning programme. The development of the educational intervention and its evaluation in pilot actions in four countries is co-funded by the European INTERREG-Danube Transnational Programme from 2018 to 2021. The intervention is currently available in five languages (English, Bulgarian, Slovenian, Slovakian, Romanian). Dialogue with patient organisations and the policy level is currently ongoing in order to introduce the intervention in Croatia. We see the initiative's activities as a contribution to creating a "Better Future of Healthy Ageing".

### B5-O2

## Commitment to Global Strategy and Action Plan on Ageing and Health

Branko Kolarić<sup>1</sup>, Tomislav Rukavina<sup>2</sup>, Lovorka Bilajac<sup>2</sup>, Tanja Ćorić<sup>1</sup>, Nada Tomasović-Mrčela<sup>1</sup>

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<sup>2</sup>School of Medicine, University of Rijeka, Croatia

Healthy Ageing is a concept that refers to developing and maintaining the functional ability that enables well-being in older age. It is a process that is implemented through the span of an entire life course. Functional ability is determined by the intrinsic capacity of an individual (i.e. the combination of all the individual's physical and mental capacities), the environment in which he or she lives (understood in the broadest sense and including physical, social and policy environments) and the interactions within them. Longer lives are one of our most remarkable collective achievements. By the year 2030, the number of people aged 60 years and older worldwide will be 34% higher, increasing from 1 billion in 2019 to 1.4 billion. The ageing of the population affects all aspects of society such as education, housing, health, long-term care, social protection, transport, information and communication, labour and financial markets as well as family structures and intergenerational ties. In this presentation, we will cover the strategic plans and actions regarding the implementation of Healthy Ageing, based on UN Political Declaration and Madrid International Plan of Action on Ageing, 2017 Lisbon Ministerial Declaration and WHO Global strategy and action plan on ageing and health. The five strategic objectives will be shortly presented: Commitment to action on Healthy Ageing in every country; Developing age-friendly environments; Aligning health systems to the needs of older populations; Developing sustainable and equitable systems for long-term care and Improving measurement, monitoring and research on Healthy Ageing. As a conclusion, and for the final challenge, we will also briefly tackle problems related to ageism and professional burn-out, in preparation for the new challenges and obstacles we will face in the future. This will enable us to be proactive and scale the ideologies of this concept.

## B5-O3

## Oživi Me – from a Student Initiative to National Campaign

Ivana Portolan Pajić<sup>1,3</sup>, Filip Glavač<sup>2,3</sup>, Monika Tomas<sup>2,3</sup>

<sup>1</sup>City Office for Health, Zagreb, Croatia

<sup>2</sup>"StEPP" student association, School of Medicine, University of Zagreb, Croatia

<sup>3</sup>"Oživi me" National campaign, Croatia

**Introduction.** The Campaign "Oživi me" offered public educations on prompt bystander cardiopulmonary resuscitation held in every major Croatian city, with the goal of informing as many interested individuals as possible. Furthermore, informative workshops were held on a monthly basis at the Croatian Heart House Foundation with the goal of providing a deeper insight into the importance of prompt bystander cardiopulmonary resuscitation with the use of AED. **Short description of practice change implemented.** The Campaign has successfully raised the awareness of the importance of early recognition of the sudden cardiac arrest, and prompt bystander cardiopulmonary resuscitation. The Campaign has been accredited by several important institutions, such as the Ministry of Health, Croatian Institute for Public Health, as well as the University of Zagreb School of Medicine and the School of Dental Medicine. "Oživi me" ("Resuscitate me") has been supported by many public individuals, from celebrities to political and medical figures as well as other esteemed individuals. With its' influence, the Campaign raised a question of the necessity of introducing the first aid and hands only CPR into the public school system curricula. **Highlights.**

The Campaign was announced and promoted via television and other electronic media by a promotional video and media interviews and presentations. An educational poster was created with the aim of placing it in public and gathering places. Through the interactive website any individual can educate him/herself through e-learning and instructive videos on hands-only cardiopulmonary resuscitation and adult basic life support with the use of AED and take part in an online educational quiz. Schools and other groups can take part in a Campaign-related mini-project "School with a heart" or "Dance to the Rhythm of the Heart" as well as "Life Hotspot". As a guidance method in case of an emergency situation, a mobile application was designed to help laymen assess the victim, call for help and deliver first aid. The application also consists of quick reminder of the standard first aid assessment, and resuscitation algorithm as well as an integrated AED map. **Conclusions.** Over 5000 laymen have been informed on early recognition and prompt first aid in

case of sudden cardiac arrest. Over 70 AED devices were installed in various regions of Croatia according to the Campaign goals. Regarding to the latest feedback from the involved participants, 8 lives were saved as a result of "Oživi me" ("Resuscitate me") workshops and educations.

## Poster presentations

No posters

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2020



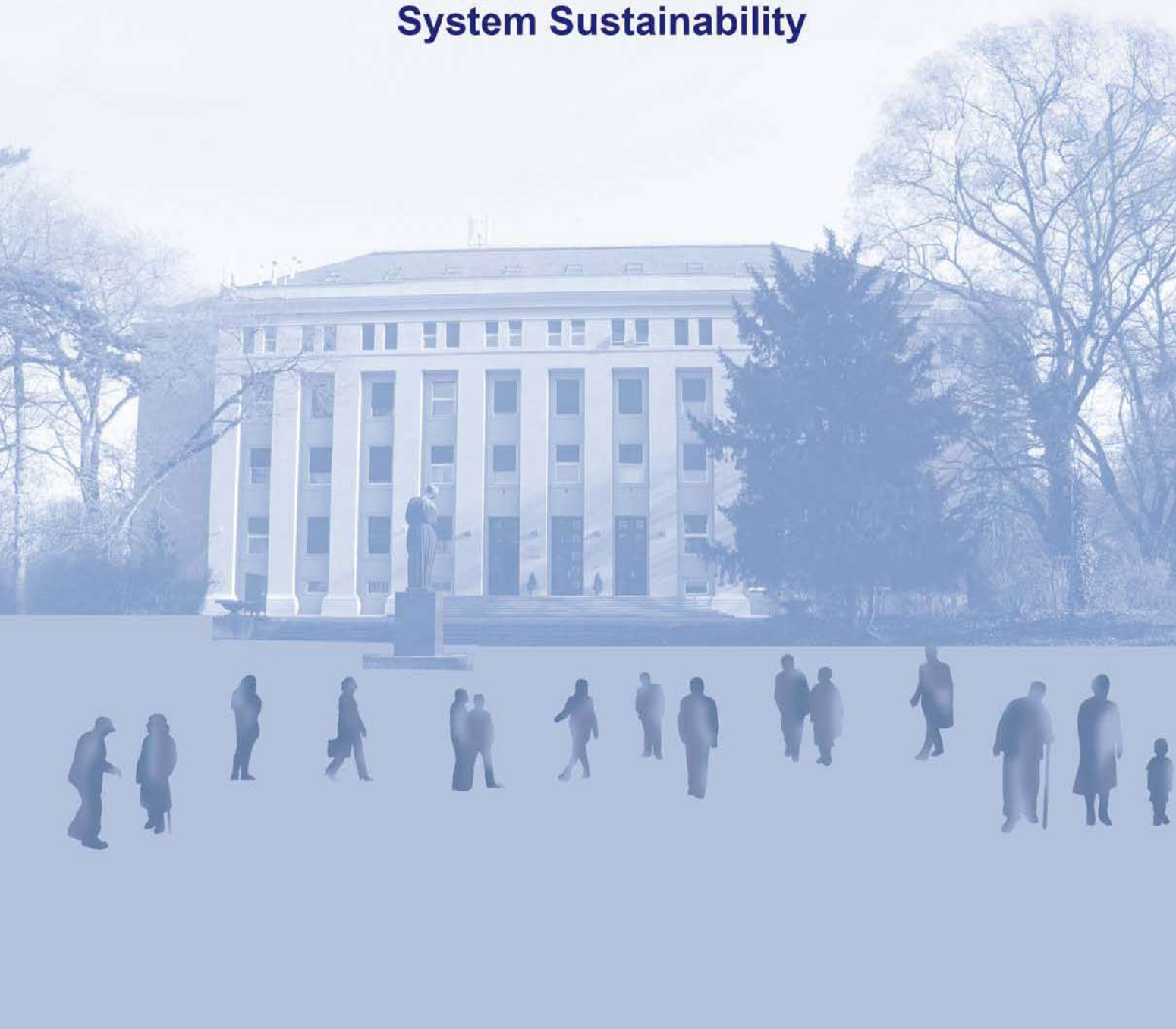
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**BETTER FUTURE of HEALTHY AGEING 2020**

Theme C

## **Ageing and Health System Sustainability**





## Session C1: Demographic Challenges in the European Ageing Societies

## Invited lecture

## C1-I

Demographic Challenges  
in the European Ageing Societies

Gerda Neyer

Stockholm University, Sweden

Over the past two decades, the aging of the European population has received increasing attention from policy makers and researchers. In all member states of the European Union the share of the population over 65 has been rising. The 2018 Aging Report issued by the European Commission projects a further greying of the European population over the next half century. It predicts a further increase in the old age dependency ratio that necessitates major reforms to tackle pension, health care and long-term care expenditure.

The old age dependency ratio varies across European countries. Differential longevity and migration dynamics account for some of these differences. A central factor driving the differences is fertility. Southern, Eastern, and the German speaking continental European countries have had persistently low or very low period total fertility rates (low = TFR 1.5 < 1.7; very low = TFR < 1.5) during the past quarter century. These countries also experienced a drop to low or even very low levels of their completed cohort fertility rate (CFR) and thus a reduction in the average number of children per woman. In 2016, the CFR of women born in 1976 varied between 1.37–1.57 in Southern Europe and 1.90 – 2.23 in Northern Europe (European Demographic Datasheet 2018). Persistently low and very low fertility will have major effects on the population age structure, on the aging of society and on the old age dependency ratio in the future.

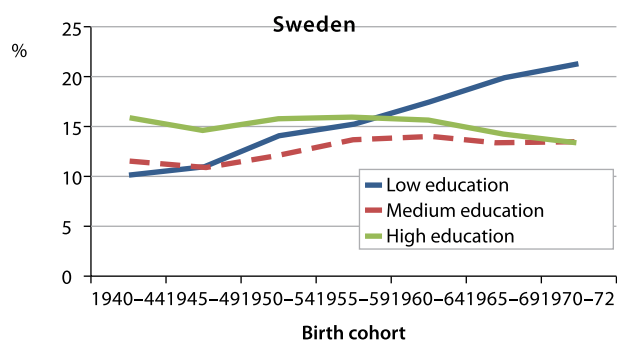
The consequences of low fertility for aging societies and the differences in fertility level across Europe have revived discourses on how to increase fertility. Several European countries have amended their family policies or introduced population policies to raise fertility. Whether and which policies will lead to sustainable fertility levels is still an open question. But some research results of recent fertility and societal developments and of links between policies and fertility may

provide some guidance as to which directions policies might take.

*Fertility and employment-supporting policies:* Low period fertility (TFR) is partly due to an increase in age at first birth. This development implies that childbearing at higher ages becomes more important for fertility levels. Since women at higher ages are usually established in the labor market, employment related policies will become more relevant for fertility. Recent research results underline the relevance of reconciliation policies for childbearing: Women living in countries with high income-related parental-leave support are found to be more inclined to have a child than women living in countries with high flat-rate, employment-unrelated leave benefits. With social security and old-age pensions being increasingly tied to continual employment throughout an individual's working age, women's and men's childbearing decisions may become even more dependent on the possibility to reconcile work and childrearing.

*Increasing female education, social inequality, and fertility:* Among the younger cohorts of women ultimate childlessness (at age 40 and above) has been increasing across Europe, but there exist still differences in completed cohort fertility and childlessness by education. A common finding among older cohorts is that women with low education have the highest average number of children and are least likely to remain childless while it is the opposite for the highly educated. With the expansion of women's education during the past decades, this pattern has changed. In many European countries, fertility among low and middle educated women has converged; but highly educated women are still more often childless than lower educated women. In the Nordic countries, however, the pattern has reversed. Highly educated women have the lowest childlessness and tend to have a higher average number of children than low educated women. This reversal in fertility among highly educated women is commonly attributed to the Nordic family policies, their employment and gender-equality orientation. With rising education among women, such policies may become a pre-requisite for further fertility development in Europe. But the development also marks a new social inequality in fertility, with consequences for familial support and well-being among the low educated, to which policies need to respond in the future.

*Increasing uncertainties and fertility:* Declining and low fertility levels and higher childlessness among the



Jalovaara, M. et al. (2019). Education, Gender and Cohort Fertility in the Nordic Countries. *European Journal of Population* 35: 563–586.

#### CHILDLESSNESS IN % AMONG SWEDISH WOMEN (AT AGE 40) BY 5-YEAR BIRTH COHORTS

low educated may be associated with increasing economic insecurities and uncertainties about the future. The economic recession that hit Europe in 2008 has led to a drop in period total fertility levels in many countries. Research related has shown that the economic recession increased the perception of insecurity in the population and that this was associated with lower childbearing intensities. The perception of uncertainty may have led to fertility declines even in the Nordic countries, whose family policies are regarded as models to maintain sustainable fertility levels. With the uncertainties created by economic crises, the current pandemic, the restructurings of labor markets and welfare states, and the aging of European societies, there is a need to pay greater attention to the consequences that this may have for fertility development and design policies to tackle them.

## Oral presentations

### C1-01

## Croatian Priority During the EU Presidency – Healthy Ageing

Krunoslav Capak<sup>1</sup>, Tomislav Benjak<sup>1</sup>, Iva Pejnović Franelić<sup>1</sup>, Ivana Pavić Šimetin<sup>1</sup>, Dunja Skoko Poljak<sup>2</sup>, Marija Bubaš<sup>1</sup>

<sup>1</sup>Croatian Institute of Public Health, Zagreb, Croatia

<sup>2</sup>Ministry of Health, Republic of Croatia

Today, most countries of the world are recording an increase in life expectancy, and the elderly account for a significant part of the global population. Globally, there were 703 million persons aged 65 or more in 2019. Over the next three decades, the global number of persons aged 65 and over is projected to more than double, reaching over 1.5 billion persons in 2050. In 2018, one fifth of EU's population was aged 65 or more. By 2050, it is projected that the percentage of persons aged 65 or more will have increased to almost 30% of the EU's population. Like most European countries, Croatia belongs among countries with extremely aged population. The share of elderly population has surpassed 10% as early as 1971, while the trend of progressive ageing is continuing further. According to Censuses, Croatia experienced an increase in the share of 65+ population from 13.1% in 1991 to 15.6% in 2001. According to the 2011 Census, the share has continued to grow to 17.7% (758,633) inhabitants aged 65 or older. Such demographic changes have a major impact on sustainable development, which is one of the reasons why the ageing challenges must be taken into consideration in all policies. With ageing, health problems become more frequent and, consequently, the healthcare needs of the population increase. Thus, an increasingly ageing population puts strain on the sustainability of health and social services. At the same time, it is important to stress that active and healthy elderly citizens contribute positively to the economy. In Commissioner Kyriakides mission letter, President von der Leyen acknowledged that “we are becoming an older society and need more complex and expensive treatments”. In line with the Treaty provisions, the Commissioner's task over the next five years is, according to this letter, to support Member States in constantly improving the quality and sustainability of our health systems in order to find ways to improve information, expertise and the exchange of best practices for the benefit of society as a whole. The Croatian Presidency proposes to continue this work and explore

how to best address the current demographic trends of population ageing by focusing on improving the use of available instruments and best practices at EU and Member States' level.

## C1-02

### What Does *Healthy Age* Mean – Sociological and Anthropological Considerations

Marija Geiger Zeman, Zdenko Zeman, Sanja Špoljar Vržina

Institute of Social Sciences Ivo Pilar, Zagreb, Croatia

According to the statistics, the population aging is a fundamental demographic process on both global and national levels (Nejašmić and Toskić 2013; Puljiz 2016; United Nations/World Population Ageing 2015). That is why aging should be considered a “great theme of the modern world” (Puljiz 2000, p. 109) and inescapable challenges whose economic, political, social, cultural and demographic importance will only increase in the coming years and decades (Zrinščak 2012). Given that aging is a phenomenon in which biological, social and cultural processes are tightly intertwined (Zeman and Geiger Zeman 2015), the scientific approach to it demands interdisciplinary collaborations and mind openness beyond usual limitations and restrictions. It is indisputable that people neither do live nor get old in a social and cultural vacuum. Therefore aging – in spite of its universal nature – always should be viewed contextually (Sokolovsky 2009) and intersectional, and one should never forget the full spectrum of important influences manifested in micro, mezzo, and macro-level (Silverstein and Giarusso 2011). By taking into account both the context of aging in Croatian society and relevant literature, the authors put the question from the perspective of sociology and anthropology: „What does ‘healthy age’ mean?“ (Hung, Kempen, De Vries 2010; Deepika and Manpreet 2015; Špoljar Vržina 2008, 2012). The authors emphasize importance of (a) finding valid answers to questions about potentials and boundaries of the idea of healthy aging; (b) getting new solutions for challenges posed by aging population in the contemporary national context; 3) creating locally based policies and programs for healthy aging that would take seriously into account both older persons' experiences and the knowledge of the professionals.

## C1-03

### Legal Protection of Older Persons: Do We Need a Special UN Convention on the Rights of Older Persons?

Sunčana Roksandić Vidlička

Department of Criminal Law, UNESCO Chair Unit in Bioethics, Faculty of Law,  
University of Zagreb, Croatia

The presentation is based on the claim that all vulnerable groups, such as the older persons, children and people with disabilities, deserve increased social protection of their rights and interests. On the UN level, by means of special Conventions, protection is provided to children and people with disabilities, but not to older persons. Therefore, the author analyses whether there is a need to support the drafting and adoption of the United Nations Convention on the Protection of the Rights of the Older Persons. The presentation will also address the current state of regulation of special rights of elderly persons at the international, European and national level.

## Poster presentations

### C1-P1

## Cognitive Impairment as Risk Factors for Falls

Lejla Ćorić, Marijana Bosnar Puretić, Mislav Budišić, Sara Drnasin, Lidija Dežmalj Grbelja, Marina Roje Bedeković

Department of Neurology, University Hospital Centre Sestre Milosrdnice, School of Medicine, University of Zagreb, Croatia

Epidemiological studies conducted in developed countries show that, one third of older adults experience a fall at least once a year. The incidence of falls increases with increasing patient's age. Patients with neurological diseases, such as Parkinson's disease, multiple sclerosis, stroke or Alzheimer's disease, experience falls significantly more frequently. These neurological diseases are known to be associated with early reduction of cognitive function but also with early development of risk factors for falls, among which the most common are postural instability, use of medication, neurocardiovascular instability – especially orthostatic hypotension, and adverse effects of environment. After experiencing a fall, the patient's quality of life is significantly reduced in most cases. Between 5-10% of falls result in severe injuries, such as head trauma or fractures. It is well known that even if serious injuries did not occur after a fall, in the patient's condition can be noticed the fear of a possible next fall, self-restriction of mobility, decreased activity, depression and social isolation. Not surprisingly, falls and injuries associated with falls are a significant problem not only for the individual but also for the social and health systems. Therefore, it can be concluded that modification of risk factors can prevent falls in patients with cognitive impairment. Clinical studies conducted in subjects with cognitive impairment and dementia, show that physical therapy may play a role in the prevention of falls. In addition, risk modification interventions in patients with cardiovascular risk factors and neurocardiovascular instability may have the effect on reducing the risk of falls.

### C1-P2

## The Correlation Between the Physical Activity and Health of Older Adults: Case of Lithuania

Asta Sarkauskiene, Leta Dromantiene, Zeneta Paskauske

Faculty of Health Science, Klaipeda University, Lithuania

**Introduction and objectives.** The rapid demographic ageing is a reality of Western Europe, where within 25 years half the population will be over 50, one quarter over 65 years old. According to statistics, in 2020 almost 20 percent of the population of Lithuania is 65 years old or over. This demographic transition requires more public attention to healthy aging (WHO, 2019). Objectives of study – active ageing strategies with the aim to reveal the links between physical activity and health of older people. **Methods.** The empiric data has been collected by applying quantitative research and semi-structured interview method. To evaluate the physical activity of older people, an adapted community questionnaire for healthy physical activity model for seniors (CHAMPS) was utilized, to assess health – the SF-36 questionnaire (Short form of health survey) and the Hygiene Institute adult lifestyle questionnaire were used. Disease classes were also presented according to the ICD-10-AM systemic list of diseases to determine if the elderly are suffering from these diseases. The study was conducted in January 2019, at Universities of Third Age in Telšiai and Klaipėda (Lithuania). 250 questionnaires were distributed during the survey, 123 of which were filled in correctly. Thus, the study included 123 persons, 8 of whom were men and 115 were women. All persons were elderly – 65 years old or over. The average age of respondents was 71.7 ( $\pm$  4.9) years. **Results.** According to the results, older people most frequently tend to do light work at home (97.6%), read (95.1%), go for a walk in order to complete certain tasks (92.7%), spend time with friends and family (91.9%), attend various events (80.5%), use a computer (77.2%), go for an easy walk to exercise or for enjoyment (74.8%), attend church (67.5%), do stretches or flexibility exercises (65.9%), walk fast (62.6%), visit a senior centre (59.3%), and do hard work at home (59.3%). Older people are predominantly affected by connective tissue and musculoskeletal disorders (56.1%), circulatory system diseases (49.6%) and diseases of the eye and the ocular adnexa (46.3%). **Conclusions.** The analysis of study results revealed and confirmed direct relation between the physical activity and health of older people. Older people, who are more likely to attend group meetings, work hard in the garden and run slowly, complain less about endocrine, nutritional and metabolic diseases. More active people are less likely to complain of depressed mood,

anxiety, nervousness, fatigue and restrictions on social activities.

### C1-P3

## Demographic Determinants of the Split-Dalmatia County Population

Ivana Marasović Šušnjara

Teaching Public Health Institute of Split-Dalmatia County, Croatia

**Introduction and objectives.** The Split-Dalmatia County (SDC) is the second largest county in Croatia, accounting for 10.6% of the population of Croatia. It is located in the central part of Southern Croatia with three distinct geographical-social units: Coast, Islands and Hinterland. As population is a core value of socio-medical interest, the aim of this paper is to present the Split-Dalmatia County population demographic determinants between the two censuses. **Methods.** The demographic analysis was based on the published 2001 and 2011 Census results and on the vital (demographic) statistics data for the period 2001–2018. **Results.** According to the 2011 Census, the SDC had a total of 454,798 residents, 71.2% in the Coastal region, 6.6% on the Islands and 22.2% in the Hinterland, with extremely uneven population density (Coastal areas 379.4; Islands 34.2, and Hinterland 40.0 inhabitants / km<sup>2</sup>). SDC demographic trend between the two censuses was negative (-8,878), the Coastal region (-754), the Islands (312) and the Hinterland (-8,436). Total depopulation was accompanied by the natural depopulation. The rate of natural increase in SDC in 2018 was -1.8/1.000 (in 2001 it was 1.0/1.000). The overall depopulation was also due to the migration trends in SDC (inter-census difference -12.531), especially in the Hinterland (inter-census difference -8.686). Age structure analytical change indicators point to a significant aging of the population. (2011 Census: average age 40.8 years; age ratio 16.6%; aging index 73.6% vs. Census 2001: average age 38.1 years; age ratio 14.3%; aging index 56.1%). According to the 2011 Census, the Islands index was 123.1%. The aging process is largely due to the declining share of the young population (0–19 years) in the total population (in 2018 it was 20.42% versus the 2001 Census: 25.5%) and the share of the fertile contingent (women aged 15–49) of the total female population (in 2018 it was 42.62% versus the 2001 Census of 47.3%). **Conclusions.** Depopulation, population aging and uneven population density are characteristics of the SDC demography, which are particularly high in the Islands and the Hinterland. This demographic situation high-

lights the increased medical care needs and associated problems facing the health sector and society as a whole, and calls for urgent measures to remedy it.

### C1-P4

## Ageing as Main Driver of Healthcare Expenditures – Reality or Not

Josipa Meštrović Špoljar

Croatian Health Insurance Fund, Zagreb, Croatia

**Introduction and objectives.** The age structure of the EU population is projected to change in the upcoming decades. Despite to Eurostat and their projection of overall increase of EU population over 2016–2070, there will be quite differences in population trends across Member States, in half of them population is going to increase and in other half to decrease. Changes in population size and age profile depend on fertility rates, life expectancy and migration. Increasing life expectancy is a great achievement of overall economy and health care system. But it is also challenge for long-term sustainability of public finances because population ageing entails additional government expenditures. **Methods.** The Ageing report 2018, made by the Economic Policy Committee (EPC) and the Commission services, underlies macroeconomic assumptions and methodologies of the age-related expenditure projection for all EU Member States and also highlights future policy challenges for governments based on demographic trends. Each EU Member State filled the questionnaire regarding age/sex specific expenditure profiles and provided country-specific information such as relevant implemented reforms. Respective services calculated age/sex expenditure profiles for each projection year up to 2070 on the basis of twelve projection scenarios. Those scenarios included demographic and non-demographic variables like ageing and health status of the population, overall economic growth, new technologies, the organisation and financing of the health care system, and health care human and capital resource inputs. **Results.** Demographic changes of population, especially ageing, are phenomenon of modern society. Ageing is one of the challenges of fiscal sustainability because the costs are allocated asymmetrical while people are getting older, smaller cohort of the elderly spent more than numerically larger but younger cohort. Twelve methodologies defined for projection of public expenditure on health care, with demographic variables in focus, affects the increase of health care costs and the public finance sustainability in the peri-

od from 2016 to 2070. **Conclusions.** Aging and demographic changes are highly influential factors of health care costs growth and finances of health systems. They should always be observed in correlation with other supply and demand health care factors (such as non-demographic factors). Aligning the health care needs of the population with limited resources, as well as ongoing efforts to increase the efficiency and quality of healthcare services, should be high on the political and economic agenda for decision makers' reforms.

## C1-P5

### Liver Transplantation and Ageing

Anna Mrzljak, Danko Mikulić, Branislav Kocman

University Hospital Merkur, School of Medicine, University of Zagreb, Croatia

**Introduction.** Liver transplantation (LT) is one of the greatest success stories of modern medicine. The treatment initially reserved for younger patients has shifted to the present situation where most transplant centers do not have a strict age limit when waitlisting the patients. In parallel, the extension of organ donation criteria has resulted in the increasing use of organs from older donors. The benefits of LT are undoubtedly great, however the growing ageing population imposes new challenges for transplant professionals. **Methods and Objective.** The literature was reviewed to investigate the liver recipient and donor age trends, and to highlight the age-related aspects for major indications for LT, in terms of selection, allocation and post-transplant outcomes in elderly liver recipients. **Results.** In the last decade there has been a significant increase in the average age of donors and recipients in LT. Regardless of the liver disease, elderly candidates have more age-related co-morbidities that may significantly affect pre- and post-transplant mortality. However, the transplant benefit may be similar in older and younger recipients, provided that elderly are carefully selected. As hepatitis C virus burden is decreasing by the use of highly effective antiviral drugs, non-alcoholic fatty liver disease (NAFLD) is becoming one of the leading indications based on cirrhosis with or without hepatocellular carcinoma HCC in elderly population. Overall, LT from older donors has good outcomes, but are not as good as those from younger donors. As the transplant population ages, issues concerning long-term exposure to immunosuppression such as metabolic complications and malignancies impose growing burden to the transplant recipients. **Conclusion.** Liver transplant recipients and donors are getting older. There is no universal age limit for LT but frailty and co-morbidities are important to consider in elderly candidates. As the world's elderly

population and the prevalence of metabolic syndrome continue to grow, NAFLD, as indication for LT is projected to increase. LT outcomes in elderly are good, but can be optimized by strategies that modify recipient co-morbidities, donor risk factors and utilize personalized allocation and immunosuppression schemes.

## C1-P6

### Challenges of Ageing and Sexual Health

Iskra Alexandra Nola<sup>1</sup>, Tatjana Nemeth Blažić<sup>2</sup>

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**Introduction.** Ageing related health is a new arising challenge and is high on the global list of public health priorities. Demographic projections say the global population aged 60+ years will double by 2050 (the proportion of 65+ in Croatia will be 26.8 %). People often stay sexually active at an elderly age, and globally sexually transmitted diseases (STD) is increasing in this population. However, sexual health among the elderly is often overlooked. Sexual health is an important aspect of health, and population ageing brings new challenges. An overview of current state of sexual health promotion among elderly in Croatia will be presented. **Methods.** Search for information on sexual health and sexuality in elderly, key words: Older people and sexual health, Older people and sexuality, Public health interventions/actions. The search included papers, scientific and professional publications and data from official national and county public health websites in Croatian language, in the period of last 5 years. **Results.** The search revealed numerous documents related to diseases common in elderly, but there was a small number of documents about sexuality in older adults, except for popular articles on the Internet with advice on how to maintain good sexual health in an old age. Valid sources, such as articles written by physicians are rare, and most of it debate on how sexuality in elderly is a taboo. Psychiatrists and psychologists are very engaged about this topic and these articles represent a valuable source of information. The official web page of the Public Health Institute of City of Zagreb, in terms of sexual health of aged people, was linked only to reproductive and urinary tract neoplasms. Preventive Activities in Croatia in 2015 included projects aimed to improve sexual health, but only in youth. We did not find any official document or national research that puts sexual health of older

people in focus. We found the topic of ageing and sexuality at the last and forthcoming Croatian Congress on gerontology and geriatrics, and two books that have been published recently. **Conclusion.** Despite implemented preventive programs targeting elderly in Croatia, none of them is dealing with their sexuality. Sexuality is part of healthy ageing and increased number of HIV infection and other STDs in older adults, may pose new problems in future. The stigma of sexuality in elderly, which makes them unwilling to share sexual issues and the lack of knowledge in health professionals, can contribute to delays in appropriate health services. One of the solutions is to strengthen education of healthcare professionals and include sexual health in geriatric care.

### C1-P7

## Work of the Second Instance Committee of the Division for Occupational Health of the Croatian Institute of Public Health from 2014 to 2019

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**Introduction and objectives.** The data on workability assessments in the archives of the Division of Occupational Health of the Croatian Institute of Public Health are available from 2011 onwards. The aim of the study was to present the results of workability assessments in relation to the age of the employees within the process of appeals to the Second-Instance Committee of the Division of Occupational Health of the Croatian Institute of Public Health. The study provides a ground for discussion on the necessity for enhancing the promotion of health in the workplace and timely activities for preserving workability of workers almost facing the age 50+. **Materials and methods.** Workability assessment is most often performed at regular intervals in accordance with by-laws. In case the employer or employee is not satisfied with the assessment, an appeal is initiated with the Second-Instance Committee in charge. Appeal proceedings are initiated and conducted in accordance with legislation regulating the field of occupational medicine. In regards to legislation, the Second Instance Committee may, for example, evaluate workability as follows: capable, incapable, temporarily incapable and assessment cannot be made. In this study, we used the data and workability evaluations in the period from 2014 to 2019. **Results.** Over a period of 5 years, 153 workers were in-

volved in the process of assessing their fitness to work. Men accounted for 81.05 % (N=124) and women 18.95 % (N=29) of the sample. The average age of the workers is 44.4 +/- 13.4 years. The majority, 57.52 % of workers were declared incapable, 24.84 % were declared capable and 17 % were temporarily incapable. The assessment could not be given in just one case. The average age of the incapable workers is 45.13 years, 48.08 of temporarily incapable and 40 years of capable workers. The incapable workers account for 43.14 % of all assessed workers with an average age of 49.5 years. In the group assessed as incapable for work, 25 % of the workers were declared incapable at a previous examination, and 75 % were declared incapable at a regular or/and an exceptional examination. Most of the incapable workers (40,9 %) are in the age group of 50-59 years, which is worrying because they are people who, given their experience, could contribute most with their work. **Conclusion.** Based on the results, it's noticed that most of incapable workers are in their 50s, who, in the case of unsuccessful vocational rehabilitation and job adjustments, lose their jobs and become unemployed or retire early. Workers need to be monitored more closely and thoroughly before the age of 50 and we need to work harder to prevent ill health"

### C1-P8

## Long-Term Care for the Elderly in Croatia

Ureljia Rodin, Ana Ivičević Uhernik, Tanja Mišić, Ranko Stevanović, Mario Trošelj, Sandra Mihel, Željka Draušnik, Vesna Štefančić Martić, Marijana Radić Vuleta, Ivan Cerovečki, Danijela Fuštin

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**Introduction and objectives.** Croatian population is experiencing a trend of progressive ageing, as the share of the 65+ population has reached 20.1% in 2018, an increase of 2.3% compared with 2008. A generally increasing trend can be observed for the whole EU (EU average 19.7% in 2018, 17.1% in 2008). Many of elderly require ongoing support on long-term basis, for nursing health care and/or for assistance with basic and/or instrumental activities of daily living (ADL and IADL). Coverage by social protection against the costs of long-term care (LTC) in old age varies widely both across and within countries in the EU. The rising costs for LTC are becoming a challenge for all Member States (MS) and put LTC on the high position on EU's social protection agenda. Croatia is situated in country group with low public expenditure on LTC (EU average in 2016 1.6%, Croatia 0.7%). Aim of this analysis was to explore expenditure for health component of LTC and discuss about challenges for ensuring fiscal

sustainability for future LTC needs. **Methods.** Health expenditure data for Croatia in 2017, classified according to System of Health Accounts (SHA) methodology, were used for analysis. Expenditures for health component of LTC including palliative care were analysed according to providers and according to financing schemes which covered the costs. **Results.** Total expenditures in 2017 for health component of LTC were 761 million HRK presenting 3.1% of current health expenditures in Croatia. Public expenditures (including government and social insurance) form the major part (94.7%) of total expenditures for health component, followed by out-of-pocket expenditures (4.3%) and voluntary health insurances (1.0%). Share of expenditures divided according to the providers in total expenditures for health component of LTC was: 47.9% in hospitals (includes departments for chronic diseases), 21.7% in residential facilities (includes hospices, homes for elderly and homes for adults with mental disorders), 17.6% for formally provided LTC at home and 10.7% for informally provided care at home (includes expenditures for paid sick leave for providing care to sick family member). **Conclusions.** Population trend in Croatia indicates progressive ageing and future rising of LTC expenditures. The public expenditure for health component of LTC is only part of the full costs of LTC, without social beneficiaries, out-of-pocket for ADL and/or IADL and informal care costs. Unpaid informal care is not included in the fiscal sustainability analysis in the SHA. Elderly with similar LTC needs can face significantly different out-of-pocket costs, depending on which MS they live in.

## C1-P9

# Demographic Challenges and Long-Term Care the Elderly in Croatia

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**Introduction and objectives.** Eurostat data (2019) showed that in EU-28 almost three quarters (72.5%) of very old people (over 85 years) had long-standing illness or a health problem, and about two thirds (66.9%) of elderly people (75–85 years) and more than half (56.9%) of old people (65–74 years). Croatia is now ranked as the 14th fastest shrinking country in the

world and have a very old population. For the EU, public expenditure on long-term care is projected to increase from 1.6% to 2.7% of GDP between 2016 and 2070. Rapid expansion in the number of very old people presses policymakers for quality and sustainable solutions for long-term care. **Methods.** Institutional and organizational documents have been analysed by the document analysis method. It included the review and evaluation of printed and electronic materials. The analytical process involved the selection, evaluation, interpretation and inference. **Results.** The long-term care services including high levels of public expenditure and coverage are characteristic of Northern European countries. Medium expenditure and coverage are characteristic of many Western countries and low expenditure and coverage by Mediterranean, Central and Eastern European countries. Croatia national-level data reveal large gaps in the provision of and access to long-term care. In 2014, less than 10 % of all elderly reported that they had made use of homecare services. The use of social services shows that of the 72,408 individuals who received the assistance and care allowance, half were over 65 years of age and two thirds received the full amount of the benefit. In 2015, 3,328 old persons received home help assistance. Also 9,287 old people have received the guaranteed minimum benefit amounting to 9.07% of all recipients of this benefit (1.16% of all old persons). Further 3,226 old people received the personal disability allowance amounting to 13.58% of all recipients of that benefit. An analysis of social protection expenditure showed that the largest part of social protection expenditure in 2016. belonged to the elderly services (34.2%). **Conclusion.** Planning for comprehensive and integrated long-term care for the elderly in Croatia needs to be discussed and promptly initiated. Recommendations go in three directions: a) developing tools and training packages to strengthen formal and informal caregivers; b) building sustainable workforce for ensuring the quality and capacity of integrated long-term care; c) increase capacity in long-term care: nursing homes, rehabilitation facilities and hospitals for long-term chronic care.

## C1-P10

# Local Community Answers to the Ageing Challenges

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**Introduction and objectives.** According to estimates from The Central Bureau of Statistics for 2018, 154,053 people over 65+, live in Zagreb, which means 19.2% of the total population. City of Zagreb, within

its strategic documents, recognized comprehensive care for elderly people as one of the most important social and public health priorities, whereby the City's activities are aimed at improving the material status of the elderly towards the development of various social services in the local community. **Methods.** In order to encourage the further development of social services, we have conducted several studies, the results of which show that awareness about programs and services is crucial for their use. The results also highlighted the need to actively promote the development of specific services such as those aimed at people with Alzheimer's and other dementias. **Results.** A significant step in the development of non-institutional services is the model of home assistance and day care services, whereas additional services are provided within the Local Community Support Program "Gerontological Centers of the City of Zagreb". This is a standard that was created in 2004 as a collaboration between City of Zagreb and Center for Gerontology Andrija Stampar Teaching Institute of Public Health. The vision of the Gerontology Centers is to adapt the local community to the needs of the elderly in order to improve their

health and functional abilities. City of Zagreb also established The Mutual path Foundation, which opened apartment-type housing units in 2012, the first such alternative accommodation for elderly in Zagreb. We are particularly focused on providing appropriate services for people with Alzheimer's and other dementias (specialized departments, counseling services for informal carers, education for staff). In order to ensure access to information on rights in the field of social protection, health insurance and other relevant information, we print the publication The Guide for Senior Citizens of City of Zagreb. Also, aware of the accelerated technological development that requires creation of innovative digital solutions, in 2018 we launched the communication platform [www.najmudriji.hr](http://www.najmudriji.hr). **Conclusion.** Aware of the specific needs of the elderly people, we are developing a social policy towards providing specialized wards for people having Alzheimer's or other dementia. Emphasis will certainly be placed on programs to prevent social exclusion, promote the health and safety of the elderly, as well as their involvement in public policy-making in order to secure a friendly local community for elderly people.

## Session C2: Bioethics and Ageing

### Invited lecture

#### C2-11

### Dignity-Enhancing Care for Older Adults: An Ethical Framework

Chris Gastmans

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The number of older adults continues to increase worldwide. Over the past decades, the growth of the aged population has been particularly notable for the oldest-old individuals, those who are 85 years and older. This group will continue to grow significantly over the next decades. Given that older adults are especially prone to suffer from dementia, many countries will be confronted with a rising number of people with dementia. It is estimated that the population suffering from dementia will double every 20 years to 42.3 million by 2020, 81.1 million by 2040, and 113 million by 2050.

These demographic evolutions result in important new responsibilities for older adults, in general, and people with dementia, in particular. How do they deal

with the risk of become care dependent? What do they think about the quality of their life and about their subsequent end of life? What are their opinions about vulnerability and dignity in old age? What arrangements do they want to make with their family about the care they will need when they become more dependent? What do they consider to be 'good care' and 'good death' for older adults? What do they consider to be their own responsibility in 'preparing for the future'? Do they want to write advance directives in order to plan their life and death after they become incompetent? What do they think about legal regulations regarding patients' rights, advance directives, euthanasia, and assisted suicide, and what do these legal frameworks mean for their own situation?

In this presentation, we will propose a comprehensive clinical-ethical framework that addresses the above-mentioned questions about care for older adults in general and persons with dementia in particular. First, we briefly outline the general philosophical-ethical background from which we developed our framework. This is based on three aspects: lived experience, interpretative dialogue, and normative standard. Against this background, we identify three cornerstone concepts that must be observed in an ethical approach on care for older adults: vulnerability, care, and dignity. Based on these concepts, we argue that the

ethical essence of care for older adults is the provision of care in response to the vulnerability of a human being in order to maintain, protect, and promote his or her dignity as much as possible.

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## C2-I2

# Ageing Ethics and Challenges for Care

Renzo Pegoraro

Pontifical Academy for Life, Vatican

The considerable prolongation of life, in our societies, has made possible by: a broad improvement of the quality of life and advancements in the medical field. This phenomenon may be seen as an important “conquest”, but it also gives rise to a new “challenge” on multiple fronts.

Questions:

The meaning to become old

The meaning to become “disabled” for the old person

The challenge for the family to take care for him/her

The role of society and institutions to help the family and the elderly

Ageing and quality of life

Ageing and “end of life”

Focusing on the question pertaining to assistance for the elderly had not so much an intention to provide an immediate “technical-medical” solution, rather to: create awareness of the problem in all its specificity and intensity – that is, in the particular way it is an issue by nature and then subsequently in the contingency of current social conditions; propose a cultural-ethical approach to the problem. When it comes to the social aspect, what is evident to everyone today is that the problems tied to care cannot be addressed in the manner that up until a decade or so ago was considered the norm. One cannot place all one’s trust in the natural solution alone, namely the family. Further-

more, the specific nature of problems associated with care, and only in the field of health, often make it a matter that exceeds the resources that are to be found within a family context. Of course the family is and continues to be an indispensable reality, something that is with difficulty replaced by “something else”. But a challenge such as the care of the elderly speaks to the community as a whole (beyond the particular and individual institutions, organizations, volunteer associations, etc.). The expectation of continuing population ageing prompts questions about welfare states’ capacity to meet the needs of their population. The State, institutions and the family cannot avoid answering the challenge that arise from the needs of the elderly. Family, Nursing homes, Christian community and Civil Society as a global net able to give answers to the elderly needs, according the different situations: no autonomous elderly; active elderly. It is important to reaffirm the intrinsic and inalienable dignity of all human beings, regardless of their age, health or existential condition and to promote and sustain mutual relationships within families, according to the principle of subsidiarity and real solidarity. It is urgent to develop a socio-cultural model including social proposal to maintain dignity and meaning for the life of elderly and the medical and care support: an holistic and integrated approach.

## Oral presentations

### C2-01

## Ethical Challenges for Healthcare Professionals in Managing Elder Abuse

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**Introduction and objectives.** Abuse is a common challenging issue in both developed and developing countries around the world. It involves issues such as healthcare, justice, ethics, and human rights. Elder abuse is an example of human rights and freedom violation that leads to a serious loss of human dignity, independence and respect, and influences ethical principles such as autonomy, competency, beneficence, and non-maleficence. Different definitions have been provided for elder abuse over time: it may be defined to an act (or to the absence of a proper act) that will cause harm or suffering to an older person, and it occurs in a relationship that normally requires trust, and may be performed only once or several times. Elder abuse is an increasingly phenomenon that has created ethical issues for care teams, thus our objective is to determine the existing ethical challenges in this context. **Methods.** The present contribution is based on a critical review to determine the ethical challenges involved in elder abuse and was conducted collecting related documents, articles and sources. **Results.** Since awareness of abuse is influenced by knowledge, expertise and preparedness, the competence of health personnel who take care of abused subjects in conducting the examination and evidence collection is of fundamental importance to identify and report mistreatments and to support vulnerable populations such as the elderly. Intervention in case of elder abuse is accompanied by ethical challenges, because lack of professional principles leads to personal, legal and ethical concerns. **Conclusions.** The goals of elder abuse prevention are to prevent unnecessary suffering, maintain autonomy, and maintain quality of life. Within this context, classical principles of medical ethics will be discussed.

### C2-02

## What Sort of Discrimination Among the Geriatric Population?

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**Introduction and objectives.** Discrimination among different social groups start to be an important public concern in the 21st century. Special population groups attract attention as deprived groups of individuals discriminated according their specific characteristics. Health and social service in Europe have a long tradition of social awareness regarding the discrimination as well as promotion of anti-discrimination of any kind. Solidarity was early introduced and stayed essence to diminish differences between social groups. Such an approach demands adequate insight into different population group's needs. **Methods.** Health needs differ according to age. When talking about age-specific health needs one must take into account which age group is more vulnerable regarding health. What about senior citizens in Europe? What are their health and social needs? How they are met and are there sufficient resources for their specific needs? And finally, are there differences in social and health needs within seniors? Several problems of geriatric care and related discrimination options emerge when that age group is observed in detail. **Results.** First, seniority is defined as age over 65 and could last for 35 or more years. Specific periods could be recognized during that period of life: pre-retirement and early retirement period, empty-nest household period, deep age, etc. Assessment of seniors' needs based on a look at the group in total can lead to discrimination.

The second differentiation lays in individual health status when entering seniority. Noncommunicable chronic diseases represent often health problems in the elderly meaning life-long medication and health status monitoring. The healthy ageing project promotes early prevention of chronic diseases resulting by chronic disease absence. Two groups of seniors on different poles of scale (multimorbidity individual versus healthy individual) have different needs at the same age. That can also be the origin of discrimination in geriatric care. The third and most important difference represents the quality of inner-circle social support. Seniors living in common households together with inner or extended families have different needs than seniors who live alone without any family relationship.

Needs for nursing-home settlement or other kinds of social/medical nursing for seniors who live alone are evident and important. Seniors who live alone could experience the whole scale of discrimination in case of medical emergencies. **Conclusion.** The problem of seniors who live alone in case of an urgent deterioration of health status represents a critical geriatric problem that must be tackled with more attention.

## C2-03

### Does Revascularisation Therapy for Acute Stroke Improve Functional Outcome in Elderly Patients?

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**Introduction and objectives.** Revascularisation therapy for acute stroke including thrombolysis and mechanical thrombectomy is now the standard care for acute ischemic stroke. However, in spite of numerous studies including elderly in the protocol, this group of patients still receive limited acute care considering modern revascularisation techniques. Furthermore, actual guidelines do differ age group of patients above 80 years considering inclusion criteria for thrombolysis. Elderly patients are more critically judged while considering inclusion/exclusion criteria for revascularisation therapy which bring us also to some ethical considerations in this growing group of acute stroke patients. In this presentation, we analysed and compared recanalisation rate and clinical outcome of our patients in 2 years period according to their age in order to check whether in our cohort age differences do influence these outcome measures. **Methods.** In our work we analysed 139 patients treated in UHC Zagreb during 2017 and 2018 for acute ischemic stroke due to large vessel occlusion by thrombectomy, preceded or not with thrombolysis. We divided patients in three groups according to their age (less than 60, 61–75 and 76 and older) and analysed their recanalisation rate (using TICI system, and considering all TICI 2b and 3 as a complete recanalisation), as well as outcomes using modified Rankin scale at 90 days considering 0–3 as good outcome. We analysed mortality

rate (mRS 6) and patients with bad outcome having mRS 4 and 5. The results were analysed and compared.

**Results.** From 139 patients 32 were younger than 60., 64 in the „middle“ age group, and 42 in the group of elderly patients (76 and older). Low recanalisation rate of TICI 2a and less had 14 patients (11%) which is a recanalisation rate according to the literature. However, the age differences in low recanalisation rate were not significant, namely low recanalisation rate had 36% of elderly patients, and 64% of middle age or younger patients. Considering clinical outcome, overall mortality in our group of patients was 13%. When we looked to the mortality rate in groups, the lowest mortality rate (3%) was in the youngest group of patients and the highest (17%) in the elderly. Bad outcome (mRS 4&5) had 5% of patients in the middle age group. **Conclusions.** According to the results of our study, it is not ethical to refrain from treating elderly people with modern revascularisation techniques in spite of higher mortality rate which is to expect in this group of patients anyway. The caution has to be aimed to the optimisation of patient selection, but not to the treatment selection or treatment withdrawal.

## Poster presentations

### C2-P1

## Ageing of the Yugoslav Population: Andrija Štampar's and Branko Kesić's Detection of Demographic Changes in the Middle of the 20<sup>th</sup> Century

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**Introduction and objectives.** The subject of gerontology aroused stronger interest among Croatian scholars only in the middle of the twentieth century, largely due to the demographic analyses brought by prominent Croatian public health experts Andrija Štampar and Branko Kesić. Our objective is to show their results in the context of the development of gerontology in Croatia. **Methods.** Our presentation is based on the analysis of vital statistics brought by Andrija Štampar in 1940, as well as his colleague and co-operator Branko Kesić in 1958. **Results.** Croatian public health pioneer Andrija Štampar was the first to an-

ticipate future public health issues regarding the ageing population. In his book *Hygiene and Social Medicine* from 1940, Štampar analyzed demographic changes in several European countries, and showed how the decrease in birth rates and the prolongation of life would change “economic and social structure” and necessitate the introduction of “new social and health measures”. Adding upon Štampar's analysis, the specialist of hygiene, social and occupational medicine Branko Kesić published in 1958 a chapter *Ageing of the Yugoslav Population* in the *Symposium on Gerontology*. Kesić noted that the age structure significantly differed between the 1931 and 1951 censuses, with the main changes being the higher life expectancy and a lower number of children. Štampar's and Kesić's analyses were the first to use census data aiming to warn about future demographic changes and their social, economic and health repercussions. **Conclusions.** Even though our public health experts focused their attention to the contemporary public health priorities such as infective diseases, sanitation etc., they did not neglect to spot the incoming demographic changes and their potential consequences. They agreed that medicine had to solve these problems not only because of its humanitarian roots, but also because of the social and economic reasons. Kesić's article thus added to Štampar's thoughts on the population structure from 1940, with a clear formulation of public health concerns that the changing vital statistics brought.

### Session C3: Epidemiological Trends on Prevention of Age Related Frailty Syndrome and Diseases

## Invited lecture

### C3-I

## Frailty – What Is and What We Can Do in Croatia?

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Ageing is one of the biggest challenges that Europe is currently facing (WHO 2015). Demographic trends suggest that there will be an increase in age-related disability and dependence, which will ultimately impact not only on the wellbeing of the individuals affected, but also on the sustainability of health and social care systems. Nevertheless, recent data suggests

that disability and dependency trajectories can be changed providing the opportunity for older adults to live longer healthy lives. For most older people, the maintenance of functional ability is of the highest importance. Healthy ageing is defined by the World Health Organization (WHO 2015) as the process of developing and maintaining the functional ability that enables well-being in older age. Therefore, identification of conditions preceding the development of disability and dependency is an essential prerequisite to effectively promote healthy ageing. Among the most important of conditions that contribute to functional impairment is frailty. Frailty is an identifiable decline in physiological systems that results in decreased reserves, confers extreme vulnerability to stressors and increases the risk of a range of adverse health outcomes such as disability, institutionalization, hospitalization and death (WHO, 2015). There is evidence that prevention and early management of frailty can avoid

many of the major negative health-related outcomes associated with ageing including functional decline and dependency (WHO, 2015). Nevertheless, although addressing frailty is a necessary step to enhance healthy ageing, frailty is not currently considered as a public health priority in many European Countries. Concern over this situation motivated the European Commission (EC) and many of the Member States (MS) to co-fund the first Joint Action (JA) on the prevention of frailty: ADVANTAGE JA. Croatian Institute of Public Health was partner in that Project. In light of fact that is first time that we have in use term frailty in Croatia, for begging, we have to start with education health professionals about all aspects of that term.

## Oral presentations

### C3-01

## Ageing and Health: Importance of the Topic for Europe and the Croatian EU Presidency

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The ageing of the population, occurring worldwide, leads to increased prevalence of chronic diseases and disability. Yet, at the same time, it offers opportunities for long and healthy lives for people. This can be seen from two perspectives: on the one hand, people live longer and to a large extent healthier. Many people can work longer, travel for leisure and practice sports. On the other hand, the COVID-19 pandemic has reminded us that older people are especially in need of protection as they are more vulnerable to illness and diseases. It is therefore not very surprising that one of the current main public health topics worldwide is healthy ageing. The World Health Organization (WHO) defines healthy ageing as “the process of developing and maintaining the functional ability that enables wellbeing in older age”.

Healthy ageing is expected to keep its importance in the coming decades in the Member States of the European Union (EU). According to Eurostat data, low birth rates and longer life expectancy are changing the shape of the population pyramid towards a much older population structure. This requires adequate social as well as public health responses in many countries. Thus, the Republic of Croatia has chosen the topic of healthy ageing as one of its priorities during its six-month presidency of the Council of the EU, from January 2020 to June 2020.

In an e-collection (<https://academic.oup.com/eurpub/pages/ageing-and-health>), we have put together articles on ageing and health, published in the European Journal of Public Health during the past three years and summarised their main findings. The oral presentation will give insights into this publication and suggest policy recommendations based on given evidence.

**C3-02****Implementation of the SEFAC Project in Four European Cities**

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**Introduction and objectives.** Europe is facing an unstoppable epidemic of chronic non-communicable diseases. That burden represents a particular challenge for the national healthcare systems, regional governments, local stakeholders and policy makers. Lifestyle changes can reduce the incidence of chronic diseases so the SEFAC project introduces a novel approach to such changes in the community with engagement of social network of health and social care professionals as well as volunteers. The main objective of the SEFAC project (GA no. 738202) is encouragement of citizens in prevention and self – management of chronic non – communicable diseases. **Participants and Methods.** A total of 360 participants who are 50 years and older and are at risk of developing major chronic diseases or have a cardiovascular disease and/or type II diabetes mellitus attended the seven week workshop program in four European pilot sites: Cornwall, UK; Rijeka, Croatia; Rotterdam, The Netherlands; and Treviso, Italy. Mindfulness based workshops aimed at improving health, promoting healthy habits and healthy lifestyle. By integrating mindfulness into the workshops, participants had the opportunity to learn new skills for improvement of self – efficacy, self – esteem and improve their ability to self – manage their health. The SEFAC program was supported by SEFAC App that was developed to improve the outcome of the workshops. **Results.** Diversity of the SEFAC project in implementation in four European cities will be shown as well as similarities. Involvement of volunteers and social/health professionals by community alliances is shown to be valuable for the sustainability and visibility of the project. **Conclusions.** Community based ap-

proach as it is presented in the SEFAC project, is a challenge for every community, but taking into account all the cultural and traditional values, it is possible to implement SEFAC in every part of EU.

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**C3-03****Moderate Alcohol Consumption and Healthy Ageing**

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It is well established that excessive alcohol intake is associated with changes in brain structures, cognitive impairments, and an increased risk of all types of dementia. On the other hand, the vast majority of well-done prospective studies indicate that in comparison with non-drinkers, moderate, non-binge-drinking elderly subjects have lower risk of cognitive impairment. Moreover, numerous cohort studies have shown that moderate drinkers tend to have longer lifespan. In some studies, a protective effect of light-to-moderate alcohol intake has been seen primarily among consumers of wine. Here we will review up to date epidemiological evidence for a favorable association between moderate alcohol intake and cognitively healthy longevity. Further, taking wine as an example, we will give an overview on the biological rationale for a protective role of its moderate consumption on brain health.

## Poster presentations

### C3-P1

## Assessment of Risk Factors Affecting the Occurrence of Functional Limitations in Elderly with Cardiovascular Diseases

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**Introduction and objectives.** The ability to perform basic and instrumental activities of daily living is a direct indicator of the level of functional capacity in old age, which is significantly affected by impaired mobility, the occurrence of cognitive-sensory deficits and chronic diseases. The purpose of this paper is to determine impact of sociodemographic and clinical risk factors on functional capacity measured by Groningen Activity Restriction Scale among elderly patients with cardiovascular disease. **Methods.** The Cronbach's alpha internal consistency coefficient was calculated for the total result. Differences in outcome with respect to age, gender, educational level, marital status, number of medications and medical diagnoses of participants were compared by t-test or one-way ANOVA. **Results.** Statistical analysis of data showed certain correlation of patient characteristics (age, gender, education) and complexity of health status with the results of assessment of existing limitations in performing basic and instrumental daily activities. **Conclusions.** The functional capacity of elderly with cardiovascular disease is under influence of a number of factors, including age, gender, educational level, as well as the number of comorbidities and medications. These factors should be taken into account when determining measures to prevent further functional decline.

### C3-P2

## Prevalence of Dementia in Croatia from 1995 to 2018

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**Introduction and objectives.** Dementia is a neurological condition characterized by functional impairment and decline in multiple cognitive domains. In

2019 „Alzheimer's Disease International“ estimates that there are over 50 million people living with dementia globally, predicted to increase to 152 million by 2050. Almost 62% of healthcare providers worldwide think that dementia is part of normal ageing, 40% of the general public think doctors and nurses ignore people with dementia. The prevalence of dementia is increasing. It is mostly demographically induced and with a lack of causal pharmacological therapies, preventive approaches are gaining in importance. Dementia is more common after the age of 65. It is important to identify the factors that may delay the onset, slow the progression, or prevent cognitive decline. The available evidence suggests that physical and intellectual activity and social engagement are the most helpful factors. **Materials and methods.** The aim of this paper is to present the prevalence of dementia in Croatia from 1995-2018. We analyzed prevalence data for Dementia F00-F03 (ICD 10) diagnosed by General/Family Medicine teams from 1995-2018, according to the Croatian Health Service Yearbook, Croatian National Institute of Public Health. Descriptive statistical methods were used for data analysis. **Results.** In the observed period in Croatia, the prevalence of dementia had an increasing trend. In 2012 the rate was highest, 290/100.000 (12,444 patients) and lowest in 1996, 132/100.000 (5,858 patients). The average annual percent change (AEP) was 3.4%. The overall increase in the prevalence rate, compared to the beginning of the observed period, was 91%. At the beginning of the observed period, one family medicine team cared for 3 patients with dementia, and at the end for 5 patients. In 20-64 age group rate ranged from 24-69/100,000; median 40/100,000; AAPC decreasing by -3.7%. In 65+ age group rate ranged from 611-1,524/100,000; median 1,253/100,000; AAPC increasing by 4.1%. **Conclusion.** In the observed period in Croatia, dementia prevalence had an increasing trend. There is a need to increase the public health awareness of dementia and improve the quality of health care, social care and long-term care support and services for people living with dementia and their families. Public health awareness campaigns for the elderly should include the promotion of physical activity, social connection, cognitive training, proper diet and management of cardiovascular risk factors. Early detection and better patient registration could be beneficial in shaping health policy and for the future development of dementia care.

**C3-P3**

## Unintentional and Intentional Injuries Mortality Data for Women Aged 50+ in Zadar County from 1998 to 2018

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**Introduction and objectives.** Injury is a major cause of preventable death and disability. Most injuries can be prevented by identifying their causes and removing these, or reducing exposure to them. Unintentional injuries result typically from transport, workplace, home and leisure time accidents. Intentional injuries result from assault and self-harm. Falls are a common problem for older people and are often the reason for hospitalization or move to a nursing home. **Materials and methods.** Aim of this paper is to present unintentional and intentional injuries mortality data for women in Zadar County from 1998-2018 at age 50+. We analyzed mortality data of the Croatian Central Bureau of Statistics for External causes, V01-Y98 according to ICD 10. Descriptive statistical methods were used for data analysis. **Results.** In Zadar County from 1998-2018 there were 2,213 deaths from injuries: 61% men, 39% women. In total death's injuries share was 6% (7% M, 5% F). Falls, suicide and transport accidents make up 75% of all injuries (73% M, 78% F). In the observed period, men died mostly from suicide 27%, transport accidents 26% and falls 20%. In the same period from injuries, 864 women died: 49% from falls, 19% suicide, and 10% transport accidents. In 0-14 age group 1%, in 15-49 age group 12% and in 50+ age group 87%. In the 0-14 age group, the most common were transport accidents. In the 15-49 age group most common were: suicide 42%, transport accidents 39%, assault 11% and falls 3%. In 50+ age group most common were: falls 56%, suicide 16%, transport accidents 6%, assault 2%. In 50+ group Exposure to unspecified factor, code X59, was very high 8%. In the observed period, the age-standardized death rate (ASDR) for External causes of death for women of all age groups ranged from 22.3-40.5/100,000; median 31.5/100,000. The average annual percentage change (AAPC) in the mortality rate was -0.25%. In age group 50+ ASDR ranged from 17.7-32.6/100,000; median 24.6/100,000. AAPC in the mortality rate was 1.21%. The ASDR for falls ranged from 7.2-17.7/100,000; median 11.9/100,000, AAPC 2.05%; for suicide 1.6-8.3/100,000; median 5.0/100,000, AAPC -1.93%; median for transport accident was 2.0/100,000; AAPC 2.69%. **Conclusion.** In

the observed period in Zadar County in age group 50+, overall trend in external causes of death had an increasing mortality trend. Falls and transport accidents had an increasing trend as well, while the suicide mortality rate decreased. Aging does not have to mean a loss of independence. Encouraging physical activities and proper nutrition can improve older people's ability to remain independent and reduce the risk of falling.

**C3-P4**

## Injuries in the Elderly in Croatia

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**Introduction and objective.** Although injuries are the leading cause of death in the first four decades of life, mortality rates of injury are the highest in elderly population.

The aim of this research is to present the burden of injuries in older age (persons 65 and older) population in Croatia. **Methods.** We used the data on injuries (ICD-10 codes V01-Y98, S00-T98) from routine mortality and morbidity statistics and database provided by the World Health Organization (Health for All database). Data were expressed as absolute numbers, percentage shares, as well as age-specific mortality rates using the revised mid-year population estimates and age-standardized mortality rates. **Results.** From 2001 to 2016 the age-standardized injury mortality rate in the elderly in Croatia showed an increasing trend (2001: 167.2/100,000, 2016: 192.6/100,000). The age-standardized injury mortality rate in the elderly in period 2001-2016 was higher than the EU and European Region rates. With 1,875 deaths and a share of 4.3%, injuries in older age (65+) in Croatia in 2018 held the fifth position behind cardiovascular diseases, neoplasm, endocrine, nutritional and metabolic diseases, and diseases of the respiratory system. In 2018, the overall injury mortality rate was: 73/100,000, but among elderly population (65+) was higher: 225.2/100,000. As to age specific overall injury mortality rates, they increase with age (age group 65-74: 86.7/100,000, age group 74-84: 242.4/100,000; age group 85+: 877.4/100,000). The male mortality rate of injuries was 247.1/100,000 and the female rate 210.3/100,000 among the population of 65+ in 2018. Falls, with 1,135 deaths and age specific rate of 136.3/100,000 were the leading external cause of death among elderly people, followed by suicides (30.7/100,000) and traffic accidents (16.7/100,000). The most

common somatic diagnosis in older people who died from accidental falls were fracture of femur and intracranial injury. More than half (62%) hospitalisation of elderly people treated for injuries in hospitals refers to injuries due to falls. **Conclusion.** Accounting for a large proportion of the overall mortality and morbidity, injuries present a major public health problem among elderly in Croatia. A systematic implementation of preventative programmes is required, especially those for falls and hip fracture prevention.

### C3-P5

## Current Health Status of People 60+ in Federation Bosnia and Herzegovina

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**Introduction and objective.** B&H is growing older. In 2018, there were about five people of working age (ages 15–64) for each person of retirement age and above (ages 65+); the proportion of older people (i.e., those aged 65 years or older) is almost 15% (14,6%) equal as youth 15% (0–14 years old). Retired people are 18,7% of total population of B&H inhabitants. Ratio of retired people (ex-workers) is equal as working population 1:1. The old-age dependency ratio in B&H (i.e., the ratio of people aged 65 years or older to people aged 15–64 years) is 42%. While the mean life expectancy at birth in F B&H increased, the healthy life expectancy is not even measured. We aimed to describe the current health status of aged population in Federation of B&H older population. **Methods.** Information on the prevalence of health problems among age 60+ in 2018 was obtained using regular health statistics, as hospital admission, and contacts with family doctors due to evident morbidity. **Results.** Reported diseases and conditions found among the population of 60+ are huge, as 40% in primary, and 42,5% of all inhabitants who were looking for health care in state health institutions of Federation B&H. Although the multimorbidity has not presented, the chronic morbidity and disability among the elderly are obvious at both, primary and secondary health care level. The widespread morbidity of cardiovascular and circulatory diseases is represent at all levels of health care, while some conditions leading to functional impairment due to complex health status deficit accumulation could be treated only in hospitals are not seen at primary level (ex-

ample of malignant, or injuries). **Discussion.** This article summarises some leading diseases that could have relevance to practitioners caring for older adults, particularly at primary health level, and in the absence of gerontologist. Management could include a proactive individualised assessment, which improves quality of life by reducing treatment burden, adverse events, and unplanned high demand health care. **Conclusion.** This paper could open the discussion how to structure the future health care system in the absence of Strategic policy document of ageing in B&H, and in the area of community development of healthy ageing centres.

### C3-P6

## Pharmacoepidemiology of Benzodiazepine Use and Ageing in the City of Zagreb, Croatia

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**Introduction and objectives.** A demographic trend of increased human life expectancy became common worldwide due to improved life standard and better access to health services. Nowadays, ageing population represents a significant global health challenge, especially considering the economic burden of age related diseases. The new concept of healthy ageing developed by the World Health Organisation emphasizes the importance of individual's functional ability in order to enable their ongoing well-being. The aim of this retrospective study was to assess benzodiazepine (BZD) utilization habits among outpatients in the city of Zagreb. **Methods.** Information on prescribed BZDs for the year 2015 in Zagreb, Croatia was obtained from the Croatian Health Insurance Fund. This data contained several social and health indicators of all patients who utilized BZDs more than 5 times in one year (drug classes N05BA, N05CD, N05CF according to the ATC Classification System). Descriptive statistic, parametric T-test and non-parametric Wilcoxon test were used to compare differences between groups in the study. The P value of <0.05 was considered statistically significant. Data analysis was performed by use of the R programming language v.3.5.1. **Results.**

Results of our analysis showed that significantly more women (472.741) than men (252.041) utilized BZDs in 2015 in Zagreb; however, men on average used more BZDs (mean  $\pm$  SD;  $11.97 \pm 6.23$ ) per year than women ( $11.24 \pm 4.97$ ) and the gender difference was statistically significant ( $p < 0.05$ ; 95% CI 0.70-0.76). There were no seasonal variations in BZD utilization. Additionally, there was no statistically significant gender difference in the order of drug prescriptions according to their chemical therapeutic subgroup. The most commonly prescribed BZDs were: diazepam, followed by alprazolam, oxazepam and zolpidem. We uncovered significant differences in BZD utilization between genders according to the first 10 clinical diagnoses for which the drugs were prescribed. Women tended to utilize BZDs at an older age than men, with a mean age of BZD utilization for women being  $65.6 \pm 15.1$  (mean  $\pm$  S D; median: 66) years vs  $59.6 \pm 15.3$  (median: 60) years for males. **Conclusions.** Rational drug prescribing and utilization present important public health issues for most countries worldwide, especially in the elderly. The obtained results indicate high prevalence of BZD use among females, and prolonged BZD utilization among males in Zagreb. These results indicate the need for improved promotion of mental health as well as rationalization of BZD prescribing, particularly in older patients and for a prolonged period of time.

### C3-P7

## Secondary Use of Routinely Collected Health Data and Caring for the Elderly: A Case Study of Potentially Harmful Prescribing

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**Introduction and objectives.** Elderly are the largest group of users of prescription medications. Over 20 % of the population in Croatia is older than 65 years and this proportion is expected to increase as the population is ageing. Due to the multi-morbidities, multiple concomitant medicines, and underlying metabolic and cognitive changes, drug prescribing in the elderly can result in adverse health outcomes and unnecessary

costs for the health system. The objective of our work is to explore the potential of secondary use of routinely collected health data for generating the evidence in support of healthy ageing, using potentially inappropriate drug prescribing as a case study. **Methods.** The Central Health Information System of the Republic of Croatia (CEZIH) is the largest source of routinely collected health data in Croatia. Based on the published functional specification, we analysed CEZIH in terms of its structure and available data elements. As a measure of inappropriate drug prescribing, we chose the internationally accepted STOPP/START criteria (Screening Tool of Older People's Prescriptions and Screening Tool to Alert to Right Treatment) for prescribing in older people. We compared the data contained in CEZIH with the information needed for the implementation of the STOPP/START criteria. **Results.** The STOPP/START criteria provide 114 evidence based rules to avoid commonly encountered points of potentially inappropriate prescribing. The precondition to apply those rules is availability of information on patient age, prescribed medications, indications, medical conditions. ePrescription contains structured information for over 99% of medicines prescribed/dispensed in the primary care setting since 2011. The attributes available in ePrescription include brand name, active substance, dose, form, indication, date of prescription and dispensation, patient identifier which allows for application of 38 STOPP/START criteria. Additional information can be retrieved from the electronic healthcare record within CEZIH (64 criteria). **Conclusion.** Routinely collected electronic patient data in Croatia can be used to generate the evidence on inappropriate drug prescribing using STOPP/START criteria. Such analyses have been done in many countries to assess suboptimal prescribing practices, however, in Croatia, this has not been the case despite the importance of the issue. Secondary use is a complex process that requires accessible data, understanding of data sources, data structure and research methodologies. Interdisciplinary and inter-institutional collaboration is important to make the most of the results and to support regulatory actions and policy development.

## C3-P8

## Cardiovascular Diseases Mortality Trends in Croatia, 2001-2018

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**Introduction.** In the last few decades mortality from cardiovascular diseases has been decreasing in many European countries. However, even with this substantial decrease, cardiovascular disease remains the leading cause of death in most developed countries, including Croatia. **Objective.** The aim of this study was to analyse trends in mortality rates due to cardiovascular diseases in Croatia between 2001 and 2018, using joinpoint regression, and to see if there are sex differences in the observed trends. **Methods.** The data on deaths from cardiovascular disease (ICD-10 codes I00-I99), by age group and gender, were obtained from the annual report of the Croatian Bureau of Statistics. We calculated the age-specific mortality rates using the revised mid-year population estimates, and rates were standardized using the age structure of Croatian Census 2011 population (HR11). We used Joinpoint Regression analysis to describe trends in mortality, with a maximum of 2 joinpoints and a Monte Carlo simulation to calculate p-values for a series of permutation tests. We applied the joinpoint analysis to the age standardized rates and their respective standard errors, for diagnosis group and each sex separately. **Results.** Cardiovascular diseases are the leading cause of mortality, contributing the most to the burden of disease and accounting for approximately 25,000 deaths per year. In 2018, 23,048 people died of cardiovascular diseases, among them 13,093 women and 9,955 men. They are a cause of death of 49% women and 38.3% men. Cardiovascular diseases are the second cause of death in persons younger than 65 years (malignant diseases are the leading cause), with 2,276 deaths and a proportion of 24.9% in mortality of this age group, respectively. There were 455 668 deaths due to cardiovascular diseases in Croatia in this 18-year period. Standardized mortality rates (ASR-E) for cardiovascular diseases in the 2001-2018 period decreased from 932.9 to 542.6/100,000 in men, and from 689 to 384.4/100,000 in women. Joinpoint analysis showed an APC (annual percent change) of -3.4% in men (CI=-3.6 to -3.1), and -3.5% (CI=-3.8 to -3.2) in women. **Conclusion.** Trends of mortality rates from cardiovascular diseases in Croatia show a continuous and significant decrease in this period. Mortality rates are falling more rapidly in women than in men. However, it is still the leading cause of death, and cardiovascular diseases mortality in Croatia remains above

the EU average, and therefore it is necessary to monitor trends and work towards reducing preventable risk factors.

## C3-P9

## Ageing of Persons Treated for Psychoactive Drug Abuse

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**Introduction.** According to the Background paper commissioned by the EMCDDA for Health and social responses to drug problems: a European guide “Responding to the needs of ageing drug users” older people with drug problems are considered those aged 40 or over whose recurrent drug use is causing them harm or is placing them at a high risk of such harm. Older people with drug problems are likely to encounter negative life outcomes due to their drug use and they have characteristics and trajectories distinct from those of their younger counterparts. The issues relating to problem substance use among older people have received little attention, and have only recently been recognized. **Methods.** The Register of persons treated for psychoactive drug abuse was established within the Croatian Institute for Public Health back in 1978. We have investigated the data from Register focusing on the issue of ageing. **Results.** People treated for psychoactive drug abuse are getting older. In 2018, their average age was 38, for opioid users 40, while ten years ago, the average age of treated people was 30. According to the data from 2018, the older adults are prevalently methadone-treated opioid users, while one-third of the younger people are non-opioid users, and younger opioid users more often receive buprenorphine as a substitute therapy. Considering non-opioids, use of sedatives and hypnotics is more widespread in older people, while cannabinoids are more prevalent in younger ones. Older drug users are mostly treated on their own initiative or by referral from a primary care physician, while in younger patients a prominent role in referring to treatment also has a family, court, police and welfare centers. Hepatitis B and Hepatitis C are significantly more present among older people with drug problems. Considering the living conditions, in 2018 the the largest proportion of older drug users has lived with their parents (32.2 percent) and this number has been steadily increasing over the last 10 years.

**Conclusions.** The number of older drug users has been increasing in Croatia and older drug users have a unique profile, different from their younger counterparts. Healthcare services, policies and relevant strategies should pay particular attention to older people with drug problems, as the number of them is increasing.

### C3-P10

## Correlation Between Physical Activity and the Quality of Life of Older People

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The aim of the study was to investigate the correlation between the physical activity and quality of life of older people. Respondents were movable, older citizens of 70-90 years (N=100). Results were obtained on the basis of the completed Quality of Life Index. Participants were divided into two groups considering the frequency of physical activities. In the 'active' group were participants who participated in some sort of physical activity two or three times a week for more than 30 minutes (n=56), and a group of inactive people included participants who were not physically active (n=44). There was a low but significant positive correlation frequency of doing physical activity and quality of life in the domain of health ( $r=0.202$ ;  $p<0.05$ ) and quality of life in the domain of performance ( $r=0.198$ ;  $p<0.05$ ). In keeping with the recommendations of the World Health Organization, a number of research results, and the results of this research, which suggests an important connection between the frequency of physical activity and health domain of quality of life, constant physical activity must be an essential measure of primary health prevention of older people, although the results of this study do not indicate a statistically significant correlation between physical activity and overall quality of life.

### C3-P11

## Vitamin D in Fall Risk Prevention in the Elderly: Current Literature Review

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**Introduction and objectives.** Nutrition and nutritional status are very important for the elderly. A balanced diet taken in adequate amounts usually provides vitamins and minerals needed by the elderly; however, vitamin D, B1, B6 & B12 and folic acid deficiencies in this population are not uncommon. Vitamin D plays an important role in maintaining calcium and bone metabolism. The lack of vitamin D and calcium are associated with osteoporosis, osteomalacia, falls and fractures in old age. This study aims to investigate into the impact of vitamin D on prevention of falls in the elderly. **Methods.** For the purpose of this literature review, the PubMed database was searched using the following keywords: fall risk, vitamin D, older population. The search was narrowed down to the contributions published in the last 10 years. **Results.** The search yielded 7 publications that satisfied the inclusion criteria. Vitamin D deficiency in older age can range from the 30th to the 50th percentile. Vitamin D serum levels were inversely associated with the first fall risk. This effect was more prominent in patients who were vitamin D-deficient at baseline and those co-administered with calcium. The quality of the evidence is low to moderate due to the heterogeneity and publication bias. Interventional measures seem necessary to increase vitamin D status and subsequently decrease the risk of falls associated with fractures and other major injuries. However, evidence gathered insofar does not allow for the determination of benefits and harms of taking vitamin D or calcium supplements in order to prevent fractures in premenopausal elderly, since the data are limited and inconsistent. **Conclusions.** Based on the available literature, it can be concluded that the intake of vitamin D in the elderly is often insufficient and can be related to falls and fractures. Nevertheless, research in this regard should be continued. In order to improve nutrition and health of the elderly residing in the Republic of Croatia, their nutrition status should be monitored, and their dietary habits evaluated on a regular basis. Should such a need arise, and should the attending physician so recommend, vitamin D supplements should be administered, combined with an appropriate physical activity.

## C3-P12

## Trends in Lung Cancer Incidence and Mortality in Croatia in the 21<sup>st</sup> Century

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**Introduction and objectives.** According to the international estimates the burden of disease regarding lung cancer in Croatia is high in comparison to other European countries (high incidence and mortality, low survival rates), and it is important to have an up-to-date insight to these issues. Many countries also report disparate trends in men and women. Our aim is to analyse incidence and mortality trends from lung cancer in Croatia, separately for men and women. **Methods.** The data on deaths from lung cancer (ICD-10 codes C33-C34), by age group and gender, was obtained from the annual report on deceased persons, prepared by the Croatian Institute of Public Health and Croatian Bureau of Statistics (CBS), while the data for cancer incidence was obtained from the Croatian National Cancer Registry. We calculated the age-specific incidence and mortality rates using the revised mid-year population estimates of the CBS, and rates were standardized using the age structure of Croatian Census 2011 population (HR11). We used a Joinpoint Regression analysis to describe trends in mortality, with a maximum of 2 joinpoints and a Monte Carlo simulation to calculate p-values for a series of permutation tests. We applied the joinpoint analysis to the age standardized rates and their respective standard errors, by sex. **Results.** Standardized incidence rates (ASR-HR11) for lung cancer in the 2001-2017 period decreased from 149.1 to 114.7/100,000 in men, and increased from 26.8 to 39.9/100,000 in women. Joinpoint analysis showed an APC (annual percent change) of -1.3% in men (95%CI=-1.7 to -1.0;  $p<0.001$ ), and +2.6% (95% CI=1.7 to 3.4;  $p<0.001$ ) in women. Standardized mortality rates (ASR-HR11) for lung cancer in the 2001-2018 period decreased from 131.9 to 107.6/100,000 in men, and increased from 20.2 to 33.8/100,000 in women. Joinpoint analysis showed an APC of -1.1% in men (95%CI=-1.2 to -0.9;  $p<0.001$ ), and +2.7% (95% CI=2.3 to 3.1;  $p<0.001$ ) in women. There were almost 50,000 deaths in 2001-2018 period due to lung cancer in Croatia. **Conclusions.** Trends in lung cancer incidence and mortality in Croatia are mostly similar to those in neighbouring countries, with a decrease of age-standardized incidence in men

but a pronounced increase in women, mostly as a reflection of changing smoking habits in the past couple of decades. In the advent of possible major changes in these trends (the introduction of the first Croatian National Cancer Plan, the National Lung Cancer Screening Programme, the availability of new immunotherapies for certain subtypes of lung cancer, etc.) it is of utmost importance to have a starting point for future comparisons.

## C3-P13

## Elderly Cardiovascular Patients in Croatia

Iskra Alexandra Nola<sup>1</sup>, Sonja Frančula-Zaninović<sup>2</sup>, Matias Trbušić<sup>3</sup>

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**Introduction and objectives.** According to the international estimates the burden of disease regarding lung cancer in Croatia is high in comparison to other European countries (high incidence and mortality, low survival rates), and it is important to have an up-to-date insight to these issues. Many countries also report disparate trends in men and women. Our aim is to analyse incidence and mortality trends from lung cancer in Croatia, separately for men and women. **Methods.** The data on deaths from lung cancer (ICD-10 codes C33-C34), by age group and gender, was obtained from the annual report on deceased persons, prepared by the Croatian Institute of Public Health and Croatian Bureau of Statistics (CBS), while the data for cancer incidence was obtained from the Croatian National Cancer Registry. We calculated the age-specific incidence and mortality rates using the revised mid-year population estimates of the CBS, and rates were standardized using the age structure of Croatian Census 2011 population (HR11). We used a Joinpoint Regression analysis to describe trends in mortality, with a maximum of 2 joinpoints and a Monte Carlo simulation to calculate p-values for a series of permutation tests. We applied the joinpoint analysis to the age standardized rates and their respective standard errors, by sex. **Results.** Standardized incidence rates (ASR-HR11) for lung cancer in the 2001-2017 period decreased from 149.1 to 114.7/100,000 in men, and increased from 26.8 to 39.9/100,000 in women. Joinpoint analysis showed an APC (annual percent change) of -1.3% in men (95%CI=-1.7 to -1.0;  $p<0.001$ ), and +2.6% (95% CI=1.7 to 3.4;  $p<0.001$ ) in women. Stan-

dardized mortality rates (ASR-HR11) for lung cancer in the 2001–2018 period decreased from 131.9 to 107.6/100,000 in men, and increased from 20.2 to 33.8/100,000 in women. Joinpoint analysis showed an APC of -1.1% in men (95%CI=-1.2 to -0.9;  $p<0.001$ ), and +2.7% (95% CI=2.3 to 3.1;  $p<0.001$ ) in women. There were almost 50,000 deaths in 2001–2018 period due to lung cancer in Croatia. **Conclusions.** Trends in lung cancer incidence and mortality in Croatia are mostly similar to those in neighbouring countries, with a decrease of age-standardized incidence in men but a pronounced increase in women, mostly as a reflection of changing smoking habits in the past couple of decades. In the advent of possible major changes in these trends (the introduction of the first Croatian National Cancer Plan, the National Lung Cancer Screening Programme, the availability of new immunotherapies for certain subtypes of lung cancer, etc.) it is of utmost importance to have a starting point for future comparisons.

### C3-P14

## Motives of Alcohol Drinking in Different Age Groups of Adults in Croatia

Diana Jovičić Burić<sup>1</sup>, Barbara Raguz<sup>1</sup>, Ljiljana Muslić<sup>1</sup>, Iva Pejnović Franelić<sup>2</sup>, Sanja Musić Milanović<sup>1,3</sup>

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**Introduction and objectives.** In order to develop and maintain the functional ability that enables well-being in older age, one must consider healthy aging as a lifelong process. When talking about protection of health of the population alcohol drinking has been recognized as public health priority. However, changes in absorption, distribution and metabolism of alcohol and medications that occur with age, as well as high prevalence of noncommunicable diseases, ask for more focused interventions in early and middle adulthood related to alcohol drinking. In order to get a better insight in drinking motives during adulthood, this study aims to compare motives for drinking among different age groups of adult population in Croatia. **Methods.** The data were collected as part of Standardized European Alcohol Survey (SEAS) during EU JARARHA project on representative household sample aged 18–64 in Croatia. The motives for drinking were

measured by a 10-item scale. Participants who reported that drink alcohol ( $n=1171$ ) were asked to assess on a 5-point scale how frequently they drank due to the reason described in the item. The FA confirmed four factors structure: motives related to pleasure, problems, needs to fit in with others and healthiness. The sample was divided into three age groups: Young or Early Adulthood (18–34), Middle Adulthood (35–49) and Late Middle Adulthood (50–64). Differences in motives for drinking between selected age groups were tested using parametric and non-parametric tests separately for each factor. **Results.** Statistically significant difference between the three age groups of participants was found in all four types of motives. The analysis showed statistically significant difference for motives related to pleasure, coping with problems and fitting in with others between participants in Young or Early Adulthood and both Middle Adulthood groups of participants. All age groups showed statistically significant differences in motives related to healthiness. Drinking because of healthiness was most frequently reported among participants in Late Middle Adulthood. **Conclusion.** The results showed that there is a difference in alcohol drinking motives between age groups. The Young/Early Adulthood age group drinks more often than the other two groups for fun, because alcohol helps them cope with problems and makes it easier for them to fit in. With aging, motives for drinking shift towards healthiness and belief that alcohol is a part of a healthy diet. The results confirm the need to consider not only patterns of drinking but also motives for drinking when planning public health interventions for specific age groups.

## Session C4: Community Based Approaches and Medical Wellness for Healthy Ageing

### Invited lecture

#### C4-I

### Population Health Initiatives, Ageing and Health System Sustainability and Promoting Healthy Longevity

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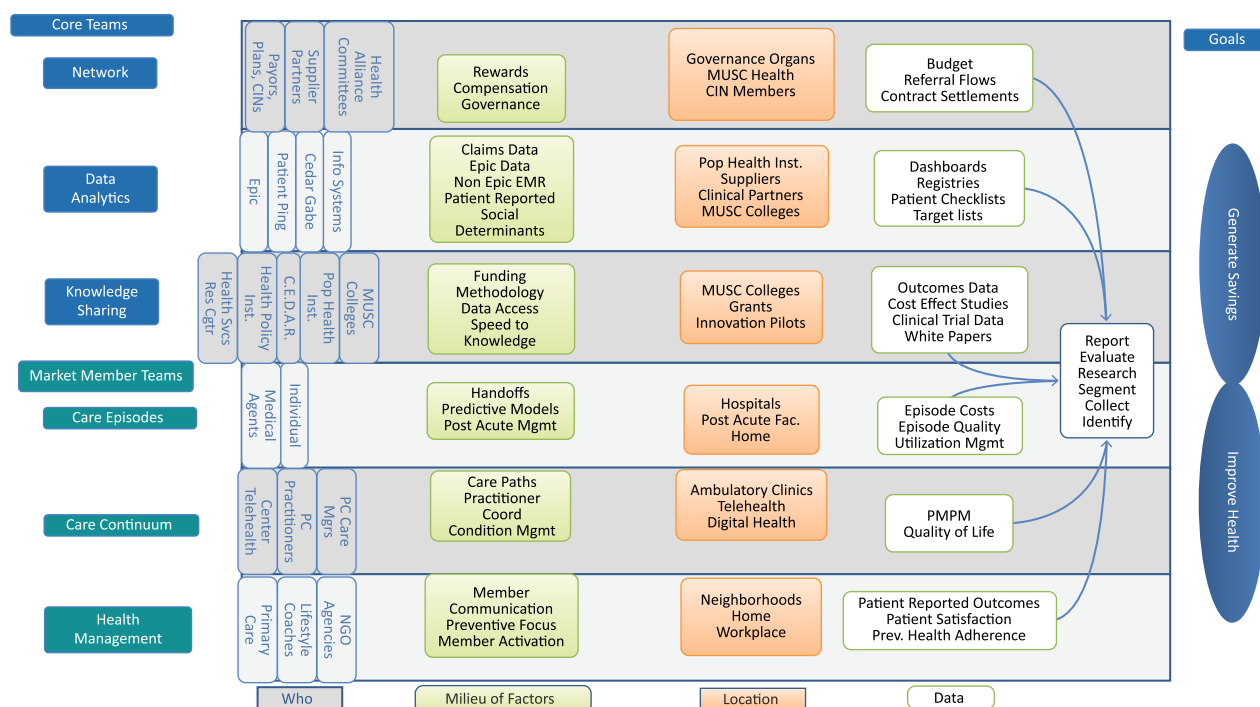
<sup>2</sup>Department of Public Health Sciences, College of Behavioral, Social & Health Sciences, Clemson University, USA

<sup>3</sup>Division of Epidemiology & Population Health Sciences, University of Miami Miller School of Medicine, USA

The future of public health and population health is dependent on: a commitment to broadening our understanding of biology and behavior; medicine, methods, and management; environment and economics;

policy and programs; and a host of other things; and the renewal of a vision of health and well-being for the whole community. There must be a corresponding commitment to the values that shape that vision. Partnerships among public health scientists who work as part of public health teams in academic medical centers, federal agencies, state and local health departments and community and international organizations are keys to our future. We present here the concept of a Population Health Institute Task Force (PHITF) at the Medical University of South Carolina was formed to examine the benefits and barriers of a PHI at MUSC and MUSC Health. Population Health Institute provides an interdisciplinary inter-professional environment supporting improvements across four clinical domains: Improved Quality of Care; Improved Patient Experience; Improved Medical Provider Experience and Reduced Medical Expenses. The Population Health Institute facilitates the successful transition to value-based care, integrating efficient systematic approaches at all levels of the patient experience to maximize the potential for Healthy Aging. This health-care landscape includes coordinating the delivery of

### Population Health Institute Strategic Approach Logic Model



information, and insights to sub populations in the region. Community and clinical actions may include individuals segmented by age lifespans, socio-economic segment, health status and psycho-social segment.

A task force has recommended the creation of a Population Health Institute (PHI) and Medical Community/Neighborhood ICCE at MUSC. The current matrix and influence of actions approach has not yielded traction in the journey to pivot from volume to value. We are faced with additional delivery system acquisitions, affiliations and organic growth as well as new value-based agreements with requisite populations. An institute or centralized approach appears to be a best practice for MUSC Health to model. A PHI can facilitate improved coordination between and among MUSC, MUSC Health and external partners for funding and investment.

New patient touchpoints must be established. Patients within high acuity episodes require deft care coordination and real-time patient management. Patients with long term conditions and risk factors for adverse health will drive new initiatives to engage patients upstream from high periods of medical services consumption and decrease the overall cost of care from a longitudinal perspective. Additional supplier services and health care team member roles are required to operate these new touchpoints.

These new approaches, innovation incubation, pilot projects and robust evaluation processes require training and education beyond our current capabilities. A systematic model of skill and knowledge infusion must be established to instill the required set of workflows and patient interactions to drive out waste, care variation and replace current approaches with proven methods to improve health in the most efficient manner. A suggested mantra is to think big – start small – and move fast. Financial justification and project management must be coordinated across a complex group of departments and teams. Although challenging, this more centralized approach is considered critical to survivability as value-based contracting continues to grow in the U.S.

Seven key areas have been outlined to provide a framework for coordinating initiatives in support of population health within the organization. These areas may not evolve into formal workstreams although they serve as a roadmap for the PHI.

- Network and Systems
- Patient Empowerment
- Knowledge Gaining and Sharing
- Data Driven Decision Making
- Longitudinal Care
- Care Episodes
- Training and Education

Longitudinal care includes both episodes of care, treatment goals, disease prevention, patient goals and plans. The overall plan should be focused on the patient and include the patient's values and preferences. This long-range plan is dynamic and designed to integrate all parties in a synchronized approach to health.

Our vision: Coordinating innovative approaches to population health across the MUSC enterprise improving health in the daily lives of the populations we serve through coordinated, innovative approaches. As a world class innovator, is to drive improvements across the spectrum of population health approaches. The Population Health Institute will collaborate in university wide research efforts including data analytics, big data insights, predictive modeling, comparative effectiveness research, and novel delivery of care interventions.

The Population Health Institute facilitates the successful transition to value-based care, integrating efficient systematic approaches at all levels of the patient experience. This healthcare landscape includes coordinating the delivery of information, and insights to sub populations in the region. Community and clinical actions may include individuals segmented by age lifespans, socio-economic segment, health status and psycho-social segment.

In this session we will also provide a high-level overview of a rural health innovation partnership that will engender healthy ageing. This includes leadership commitment, county and region-wide health outcome data analysis, legislator and key stakeholder buy-in, joint pilot study programming, early successes, and lessons learned. In addition, we will review how we are addressing in South Carolina the challenges associated with increased lifespan and growth of the older population globally. Our team seeks to enhance the implementation of evidence-based interventions to reduce the burden of obesity and related conditions, such as diabetes, especially in minority older adults with less access to care. We will review lessons learned promoting healthy longevity with our multidisciplinary team in South Carolina.

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## Oral presentations

### C4-O1

#### Increasing Wellbeing Through Co-production of Health Promotion Activities at the Local Level – the Role of Senior Councils

Iwona Kowalska-Bobko<sup>1</sup>, Aldona Frąckiewicz-Wronka<sup>2</sup>, Anna Kozak<sup>2</sup>

<sup>1</sup> Department of Public Health, Institute of Public Health, Jagiellonian University Medical Collage, Krakow, Poland

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Drawing on the literature review, analysis of documents and observation of practices, this paper sheds light on the role of Seniors Councils in increasing wellbeing through co-production of health promotion activities at the local level. Wellbeing is more than just happiness. It means developing as a person, being fulfilled, and making a contribution to the community. This last element makes that the co-production of public services – with all its capacity to increase the social capital and to address social needs and public expectation – has the potential to contribute to the wellbeing in every age group. Co-production is defined as the voluntary or involuntary involvement of public service users in any of the design, management, delivery and/or evaluation of public services. Due to the demographic changes and their consequences, particular attention should be paid to the wellbeing in old age. The significant role in this area can play Senior Councils which are active actors the field of social services and prevention and health promotion and important partners for the local governments. Many older people enjoy life, but a significant proportion struggle with loneliness, isolation, low-level mental health problems like depression or even more serious problems that lead to suicide. There is a wealth of evidence showing that physical health is closely associated with emotional wellbeing. This is particularly relevant for older people, who suffer much higher levels of chronic ill health than the rest of the population. The conducted analysis of documents and practices show that the co-production of health promotion activities by Seniors Councils and the local governments in Poland occurs, is conducive to the maintenance of health and prevention of disease, thus contributing to improve the wellbeing of seniors.

### C4-O2

#### Health Promotion for Older People in Europe – the Results of Pro-Health 65+ Project

Stanisława Golinowska, Marzena Tambor

Department of Health Economics and Social Security, Institute of Public Health, Jagiellonian University Medical Collage, Krakow, Poland

**Introduction.** Population ageing has been affecting all countries across the European Union (EU). It poses significant economic and social challenges, especially in Central and Eastern European countries where ageing process it is very dynamic while policy response is often inadequate, resulting in poor health and low quality of life of older people. Health promotion has been proposed as a measure to delay health deterioration and enable senior citizens to live relatively healthy and independent lives, and it serves as a base for the EU healthy ageing strategy and consequent European countries' activities in this area. **Methods.** We present the results of an international project Pro-Health 65+ (2014-2017) on health promotion policies for older people in European countries. We include ten European countries, which represent three country groups of different economic development, population health status, and welfare state model: 1) Germany, Netherlands; 2) Italy, Portugal, Greece; 3) Poland, Czech Republic, Hungary, Bulgaria and Lithuania. The cross-country comparison was based on literature reviews, including national regulations, as well as information obtained from country experts through questionnaire prepared for the study purpose. **Results.** The results indicate that the aging of the population in European countries commonly spurs actions related to improving and sustaining the health of older people. In less affluent countries, adopting laws and policy strategies on public health and health promotion, has taken place. In wealthier countries, like the Netherlands and Germany, a number of practical measures aimed at older people already follow implemented regulations. Health promotion programs are undertaken by public entities – at the central, regional and local level, however, a considerable amount of activities is initiated and lead by non-governmental organizations. Further, we observe that organizational solutions for health promotion in European countries are not always clearly defined. There is also lack of resources, i.e. professional health promoters and funds, particularly in less affluent countries. Scarcity of evidence on effectiveness and efficiency of health promotion for older people as well as skepticism of health care professionals in this matter, have been also recognized as hindering factors. **Conclusions.** Adequate regulations, institu-

tions and funds are necessary to improve older people well-being through health promotion in European countries. More research to generate sound evidence, and education to prepare qualified health promoters are also crucial factors.

#### C4-03

### Community-Based Approaches Towards Healthy Ageing in Croatian Healthy Cities and Counties

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**Introduction and objectives.** The Croatian Healthy Cities Network (CHCN) is, since 1990, organized and hosted within the Andrija Štampar School of Public Health (ASSPH) that provides academic knowledge and research tools to support local authorities, enabling them to put healthy cities concept into practice. Since the Consensus Conference held in Rijeka in 1996, when quality of life of the elderly was voiced as a priority in official local self-government document for the first time, until today there has been a continuity and dedication to the priority of healthy aging. In 2015, existing interventions carried out by the CHCN members were reviewed with the aim to evaluate their efficiency. **Methods.** CHCN had initiated the project 'Introducing academic standards in the process of selection of public health interventions'. The academic team developed a "matrix of program description" to gather data on activities, features, and results of each program carried out by CHCN members. **Results.** Information were collected on 60 existing local public health programs, 28 of which related to healthy aging. Strategic, educational and direct service interventions emerged as three main characteristic differences of programs according to which programs were grouped. Strategic programs included comprehensive healthy aging policy development and implementation with the emphasis on transparent policy making process and development of local government acts and procedures aimed at equalizing opportunities. Educational interventions aimed at increasing visibility and optimal usage of available resources and services, lifelong

learning and modifying users' behaviour. Direct service interventions aimed at bringing services closer to users, improving accessibility and establishing continuity of care. These were provided within health care system, social welfare system and civil society, therefore strengthening social cohesion. Although implementation of a large number of programs was carried out their quality was uneven. Half of the programs were mono-competent as opposed to comprehensive programs, and thus achieved limited results. **Conclusion.** In order to create aging friendly environment healthy aging strategies and interventions should be devised comprehensively, contain a continuous needs assessment and evaluation, mechanisms to detect people in need and provide a wide range of services involving all relevant sectors (urban planning, culture, education, economy...).

#### C4-04

### Towards Sustainable Ageing: Overcoming Obstacles in an Industrial Environment

Efstathios Restemis

Municipality of Aspropyrgos, Greece

The Municipality of Aspropyrgos, Greece, well aware of the challenges of healthy ageing, has built its strategic plan, in three basic and broader pillars, in order to provide its citizens with longevity, quality of life and subjective happiness (positive psychology).

1. Free Medical Exams: covering a wide spectrum of nearly ALL known proactive and diagnostic exams, of nearly all medical faculties. E.g., breast cancer, Pap test, blood tests, otolaryngological exams, ophthalmic exams, spirometries, as well as special exams on the consequences of environmental pollution on human health, in cooperation with specific scientific bodies and national universities (Kapodistrian, West Attica)

2. Various Athletic Programs: In a recent cooperation with the Kapodistrian University and the Stavros Niarchos Foundation, a new program was launched under the name "Exercise is Medicine", focusing on the new accredited trend of mass exercise. Apart that, many conventional programmes are running, such as rhythmic gymnastics, aerobics, pilates, Swedish exercise, as well as special sea baths, accompanied with a strong aquatic exercise protocol.

3. Recreational Events & Life Long Learning. Traditional Dances, Theatrical Events, Visits in Museums, Theatres, Natural Beauty Spots, Choir, Exchange of

Cultural Associations, as well as a local, municipal Open University (lecturing every Monday), focusing on various themes, especially of informative Medicine as well as Nutrition (Mediterranean Diet).

We do understand that although man has no responsibility of the notion of time itself, he/she has an absolute responsibility for its management, a management of multidimensional fabric. We do believe that our municipality is doing its best to institutionalize these management tools for its citizens, while motivating them, supporting them, and empowering them, to achieve a prosperous, vigorous, functional and gracious ageing.

## Poster presentations

### C4-P1

## Healthy Aging Strategy of the City of Poreč-Parenzo

Nataša Basanić Čuš<sup>1</sup>, Tihana Mikulčić<sup>2</sup>

<sup>1</sup>Healthy City of Poreč Project, Croatia

<sup>2</sup>Home for the elderly and disabled people Poreč, Croatia

City of Poreč joined the worldwide movement of healthy cities in the 1990s. Developing local policies for health and social well-being The Healthy City of Poreč identified local priorities for health and social security for years. The project Healthy City of Poreč is the base for the adoption of strategic documents (health plans) which contains local protection standards for all residents, especially for vulnerable groups. The plans for the health of the City of Poreč-Parenzo have been adopted at the level of the profession, the public and the executive. They are based on available indicators and a quantitative and qualitative methodology for researching community needs, relying on the Support Center of the Croatian Network of Healthy Cities, based at the Andrija Štampar School of Public Health, University of Zagreb. The elderly, as an age-developmentally vulnerable group, are one of Poreč's continuously and long-term identified priorities in the cycles of local health planning. Caring for the elderly and improving their community life were a priority in the planning period for 2006-2016. and in the new period of planning following the evaluation and implementation of the methodology for redefining health priorities in period 2017-2027. Poreč is a community that, unlike many in Croatia, has a positive natural increase. However, at the same time the number of the elderly over 65 is increasing. The share of the elderly, in the total population of Poreč, has increased according to the available indicators from the two censuses from 11.9% in 2001 to 14.69% in 2011. Based on years of comprehensive creation of conditions for a better quality of life for the elderly, in 2015. was created a local strategic document in Poreč called – Healthy Aging Strategy of the City of Poreč-Parenzo 2015-2020. It has become the backbone of the above standards for the health of the elderly in the City of Poreč. The elderly became a recognized vulnerable group in Poreč, in relation to which are developed and implemented local institutional and non-institutional programs (services) in the community as a protective contribution and support of the community to the process of healthy, active aging. At the end of the implementation timeline, the Strategy has been fully implemented

and its continuation is planned to improve the quality of life and health of the elderly in the community for the future period. The implementation of programs, activities and measures from the Strategy includes, among other programs, support for the development of volunteer assistance for the elderly in collaboration with international volunteer organizations.

#### C4-P2

### Do Healthcare Professionals Age Healthy?

Hana Brborović<sup>1</sup>, Ines Šarić<sup>2</sup>, Željka Sokolović Pavić<sup>2</sup>, Marija Bubaš<sup>2</sup>, Milan Milošević<sup>1</sup>, Roko Žaja<sup>1</sup>, Ognjen Brborović<sup>3</sup>

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**Introduction and objectives.** Healthcare became one of the most dangerous industries. The number of recognised occupational diseases and accidents at work for the healthcare are among the highest of all industries. The question remains, do healthcare professionals age healthy? **Methods.** Registry of Occupational Diseases and Registry of Accidents at Work were searched to identify relevant data on occupational diseases and accidents at work in healthcare and social services sector. Additionally, the occupational diseases data were searched to identify recognized occupational diseases for doctors and nurses in the 2009-2019 period. Various data sources were investigated to find information on work-related diseases as well as other types of chronic diseases for healthcare professionals. **Results.** In the 2009-2019 period, a total of 27 doctors had recognized occupational diseases. The average age was 48.19. The most common recognized occupational diseases were various acute infectious diseases, followed by occupational cancer and chronic hepatitis. In the same period a total of 73 nurses had recognized occupational diseases. The average age was 46.52. The most common recognized occupational diseases were various acute infectious diseases, chronic hepatitis and irritative contact dermatitis. A total of 1775 accidents at work were recognized for healthcare professionals (out of total 18 724) in 2018. The majority of accidents were falling down, as a result of moving with the outcome distortions, sprains and strains of the upper limbs, most commonly fingers. The data about work-related diseases as well as other types of chronic diseases for healthcare professionals were not publically available. **Conclusion.** Results provided do not neces-

sarily show the actual numbers of occupational diseases and accidents at work. We found no data on the number of work-related diseases as well as other types of chronic diseases for healthcare professionals. Literature suggests that up to 95% of population suffers from some type of work-related diseases by the age of 55.

#### C4-P3

### Healthy Ageing for Healthcare Professionals: A Transition to a New Role in Retirement

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**Introduction.** The aim of this review is to describe the impact of ageing for healthcare professionals and to provide guidelines to healthy transition to the retirement. Croatian healthcare professionals are aging and working in working sector that is in the top tree most hazardous due to occupational diseases and accidents at work. **Methods.** Literature review was made in PubMed database, searching only English and Croatian language articles with MeSH terms: Healthy Aging, Aging, Physicians, Chronic Diseases, Retirement, Occupational Diseases, combining with key words: healthcare workers, work ability, professional diseases. Registry of Occupational Diseases and Registry of Accidents at Work were searched to identify relevant data on occupational diseases and accidents at work in healthcare and social services sector. **Results.** The data from the 2018 Registry of Occupational Diseases report showed that out of 80 recognized occupational diseases, 27 of them were from the healthcare and social services sector making the highest rank. The average duration of exposure time was 20.35 years. 42.5 – 59 years of age. The data from the 2018 Registry of Accidents at Work report for the healthcare and social services sector showed that out of 1775 recognized accidents at work, the majority were healthcare professionals in the age group 51-61 (32-51%) and the following was the age group 41-50 (24.56%). No data were available on Croatian healthcare professional's other aspects of health (chronic or work-related). Our review showed that the clinical ability can be compromised with reduced muscle strength, visual and auditory deterioration, which are physical issues, related to

ageing. Accumulation of chronic diseases further reduces capacity. Cognitive decline is particular important, as good medical care requires considerable cognitive function. Here we present, the most significant recommendations how to make healthy transition in to the retirement: 1. Adjusting clinical practice to compensate for age, reducing work-load, consider slowing down in aspects of practice that require rapid cognitive processing, 2. Continuing late professional development – mentoring, teaching, contributing to professional organizations, 3. Health and well-being -maintaining a healthy lifestyle with regular health check-ups, 4. Actively and positive assisting their members to transition successfully into changing work roles towards the end of their professional life, 5. Financial health continuing working in private health sector, working part time with reduced taxes. **Conclusion.** Based on literary review the most significant recommendations were emphasized to preserve health and work ability.

#### C4-P4

### Multidisciplinary Approach to Healthy Ageing in the Work of a Public Health Nurse

Danijela-Lana Domitrović

Health Center Zagreb – Zapad, Croatia

**Introduction and objective.** Promoting health and preventative work by family doctors and nurses is needed to maintaining health, improving a healthy lifestyle, and changing harmful habits. The goal of this course of action is to improve health and preserve functional ability into old age. **Methods.** Mutual geroprophylactic measures are improving the health state of the elderly population, preventing early mortality, functional disability and sick aging. The nurse, according to the Health Care Plan and Program, provides insight into the family, as well as the entire community, their social, cultural, intellectual and spiritual approach to life, and other environmental factors. In day-to-day work, she detects high-risk individuals or people with symptoms or signs that may already have an impact on health and, based on subjective and objective data, evaluates and plans activities (individual and group) in collaboration with family doctors in other medical and non-medical institutions, organizations and associations. **Conclusion.** Multidisciplinary approach ensures affordable, effective, continuous and holistic care that contributes to improving the quality of healthy aging.

#### C4-P5

### Music and Psychological Resilience in the Process of Healthy Ageing

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**Introduction and objectives.** An interest for healthy ageing has been growing rapidly in the recent years. Healthy ageing, resilience, music and expression of movement are related phenomena. The objective of this abstract is to show our model for the process of healthy ageing through music and expression of movement. **Methods.** A narrative review. **Results.** These findings demonstrate our theoretical and clinical approaches. Resilience represents a very complex, multi-dimensional and dynamic process, highly important for understanding of salutogenesis and pathogenesis as well as healthy ageing. Resilience may be defined as a collection of protective factors that mediate the relationship between a stressful event, e.g. disease, and positive outcomes. Resilience is considered a modifiable process, gradually developed through the life span, by facing and overcoming of adversary events. Recent research has shown that the brain, due to its neuroplasticity, has the ability to change throughout our entire life, growing new cells and connections. Interventions to promote resilience and healthy ageing can be organized around three areas: 1. Developing disposition attributes of the individual such as healthy life style, physical activity and robustness; vitality, optimism and positive affectivity. 2. Practicing positive mutual interactions with supportive resource. 3. Strengthening self-efficacy and self-esteem, as well as having a purpose in life. Music, in particular, can help an individual build their resilience. Music making can enhance the function and structure of many brain areas in adults, proving that training-induced plasticity is not restricted to the developing brain. Even more interestingly, research has shown that daily music listening can improve auditory and verbal memory, attention and mood, thus contributing to the increase in psychological resilience in both children and adults. Passive music listening has been proven to increase levels of oxytocin in adults, and active music participation (like group singing and dancing) has shown the same results. Individual music listening as well as group music activities, such as choir singing or group dancing (a practice such as 5Rhythms) would not only be beneficial to building psychological resilience, but

would also promote bonding, social interaction, sense of well-being and improve auditory and verbal memory in older adults. **Conclusions.** This is our theoretical concept that we intend to execute through adequate models in practice.

#### C4-P6

### Quality Aging in Krapina-Zagorje County

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“We are helping the elderly“ – (MI POmažemo Starijima – MIPOS) is a project that empowers and employs women to help the needy members of the Krapina-Zagorje County (KZC). The project promotes social justice and ensures a better quality of life for county residents. The project employs 55 women who provide home help services for 313 users, elderly people. The MIPOS project, in addition to the employment of women for a period of 24 months, also provided education in the field of a geo-nurse / caregiver. The Ministry of science and education has verified the mentioned programs and the women involved in the project have obtained a formal certificate of education that will provide them with easier employability after the completion of the project. This ensures that the long-term sustainability of the project is maintained. The overall objective of the MIPOS project is to achieve social cohesion and improve the quality of life in KZC, and the specific objective is to integrate disadvantaged women into the world of work. The analysis of the problem indicated that women are disadvantaged in the labor market and that it is necessary to focus resources on empowering them. One way to empower unemployed women is to invest in education that will improve their capacities, work potential and empower them to enter the labor market. The institutional sustainability of the project has been ensured through the strengthening of the capacity of the NGOs to provide social services. The project partners, primarily associations, have strengthened their administrative and implementation capacities and put in place a functional home assistance service for their beneficiaries that they will be able to use after the end of the project. The established system of control of beneficiaries and women who provide services, elaborated forms and implementation mechanisms remain permanently owned by the project partners and is used as an example of good practice in the local community, and disseminated to other stakeholders within and outside the KZC. The project created unique forms for moni-

toring women's work and identifying user needs. The wide partnership of local self-government units and associations in the KZC in the MIPOS project has fostered a sense of social sensitivity among citizens and created a platform for continuation of activities and designing of a new offer of social services. The established concepts of non-institutional assistance to end-users has emerged as an example of the good practice of broad partnership that has led to changes at the regional level.

#### C4-P7

### SWOT Analysis of Retirement Club

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**Introduction and objectives.** Previous publications show various problems that people over 65 have to deal with. Some of them are loneliness, illness, financial problems etc. People at that age are also known to have health problems such as obesity, which increases the risk of chronic illness. For people over 65 there are retirement clubs in our community. Those clubs allow them to socialize with other people of similar age and make new friendships. They also go on trips around the country and beyond, mostly once a month and have constant physical activity, on average twice a week. The main objective of this paper is to critically examine the strengths and weaknesses of such community and to identify opportunities for improvements and obstacles that they may encounter. **Methods.** For this paper SWOT analysis was used. It involves identifying key strengths and weaknesses in the internal environment and opportunities and threats in external environment. Although it may not be possible to influence the external environment, it is important to know what opportunities and dangers are present in it. **Results.** Research has shown that such associations have many opportunities, especially if government organizations are involved. However, there are also several problems, mainly of a financial nature, which make some of the identified opportunities impossible. An additional problem is that people learn about such associations verbally and most often members come because one of their friends brought them. **Conclusion.** Based on the results obtained, associations can achieve better organization and apply for donations to get more people involved or to have more activities. Information on the workings of such associations could also be expanded and more people might be interested.

## C4-P8

## Demonstrating Models of Good Practice in Working with Older People by Implementing Healthy City and Healthy County Projects

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**Introduction and objectives.** Ageing is one of the greatest social, economic and health challenges of the 21st century. The share of people older than 65 in Primorsko-goranska county (PGZ), according to the last census (2011) was to 17.7% of the total population; in 2018 it was 18,91%, while in the city of Rijeka amounts 19,74%. Therefore, the goal of the Rijeka-healthy city and healthy county projects is to promote active, healthy, productive aging, preserve functional ability, improve health behavior, prevent risk factors in the occurrence of diseases and injuries retain the elderly in their place of residence through one of their priorities and with their own family, improving care and creating a "family spirit" in care institutions. **Methods.** Primorsko-goranska county has been an active member of Croatian Network of Healthy Cities since 2004. Rijeka has also been recognized internationally through membership of WHO Working Group of Healthy Aging and the Alliance for Demographic Change. In both projects, healthy aging was a priority. Numerous activities have been carried out to improve the quality of life of the elderly and are presented here. **Results.** Healthy county activities:

I. Health aspects: (health literacy program; cardiovascular disease prevention program for residents of PGZ)

II. Social aspects: (establishment of home communities; introducing EQALIN quality system into nursing homes; development of a guide for seniors PGZ-printed educational material; extending non-institutional care to organized home help and care activities; hello home care program for Kantrida nursery home; the festival of sports and recreational sports, thanks to which the first Olympiad for seniors was held).

Activities Rijeka-healthy city:

1. Creation and distribution of two 50+ publications
2. Provision of poverty relief assistance measures
3. Financing the work of 16 retirement clubs
4. Co-financing free exercise programs
5. Co-financing the work for the University for the third age

6. Implementation of IT literacy project

7. A healthy aging group formed

**Conclusion.** Health care of the elderly is an indicator of progress, but also of the failure of health care for the population as a whole, the responsibility of society is important, with special emphasis on ensuring active, healthy ageing, so the both projects have initiated changes in perceptions of ageing, creating new conditions for new models of active healthy ageing, encouraging the participation of elderly in the community and in the work place, improving and preserving the health, functional ability and quality of life of elderly.

## C4-P9

## Older Workers in the World of Work – Psychosocial Aspect

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**Introduction.** Aging workforce is an important challenge for organizations across European Union. It is expected that the number of older workers will increase in the future, so it is necessary to devote more attention to this specific group of workers. Due to age related stereotypes, older workers are often perceived as less productive and less motivated to work, making more expenses than benefits for the companies. However, older workers, if encouraged and well managed, are valuable source of knowledge, expertise and experience. This article focuses on specific psychosocial issues that affect older workers' health, motivation, productivity and well-being at work. **Methods.** In this article a literature review approach is used to discuss main age-related factors and psychosocial issues specific for older workers. **Results.** Older workers experience some age-related changes, mainly in decline of physical or sensory capacities and cognitive abilities. However, they can compensate those age-related functionality losses with work experience and accumulated knowledge. Specific psychosocial issues affect older workers, more than other age groups, such as age stereotypes and discrimination, less education and career opportunities, low job autonomy, technological changes or job insecurity. On the other hand, older workers report higher work related well-being, have a more positive attitude towards their job and show higher job satisfaction. Older workers may perceive their work less stressful, mainly because they developed different coping strategies through the years of working experience, and are able to adapt these strategies depending on the requirements of particular stressful situation. **Conclusion.** Aging workforce challenges organizations

to develop and implement policies and practices that would keep workers healthy, motivated and productive. Rather than focusing on certain disabilities, such policies should aim at improving potentials of all age groups. Engaging and encouraging older workers to remain active and contribute to the world of work should be of interest to all, employers, organizations and society as a whole.

#### C4-P10

### Healthy Ageing Promotion Throughout the Life-Course: Nurses as a Link Between Health System and Communities

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**Introduction and objectives.** Within the health promotion practice it is necessary to enable people to take care of their own health. This can be done through education, support, urban planning for health and other methods that will empower people to have all the tools, knowledge and the environments to remain their health far into the old age. By creating healthy habits through early childhood and ensuring support throughout the life-course, healthy ageing will be enabled in its full potential. One of the key links between public health system and the people are nurses. Nurses' role is therefore important in the promotion of healthy ageing and overall life-course health. The goal of this paper is to present possibilities for collaboration between health sector and communities with nurses as the key link between the two. **Methods.** Croatia Health Promotion National Program Healthy Living aims to ensure that people learn how to keep their health and have support in the environment for leading healthy lifestyles. Due to its comprehensiveness, Healthy Living is divided into five components: Health Education, Health and Physical Activity, Health and the Nutrition, Health and the Workplace and Health and the environment. All of these components focus on maintaining lifelong health, whereas three out of these five, Health Education, Health and Physical Activity and Health and the Environment, can be strengthened by including nurses into its implementation. **Results.** Within the Health Education Component, nurses are recognized as the health ambassadors from the earliest age. For this purpose, education material was created

that is implemented by nurses in all day care centers in Croatia with the goal of teaching children the basics of healthy lifestyles. Further, in the Health and Physical Activity Component nurses are a link between health system and people with chronic illnesses who are not sufficiently physically active. The role of nurses is to motivate these insufficiently active, mostly elderly people to engage in regularly organized and professionally supervised walking activity. Finally, in the Health and the Environment component nurses are the key health professionals who have all sufficient resources to connect people of all age groups to participate together in organized health promotion activities in city parks. **Conclusion.** In order to efficiently promote lifelong health including healthy ageing nurses are an important link between communities and health system. By empowering nurses due to their role in the society, it will be easier to reach people of all ages before the onset of the disease and motivate them to pursue healthy lifestyles.

#### C4-P11

### Care for Elderly Women with Cancer at the Everything for Her Centre for Psychological Support

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Ageing itself poses great challenges for a person, but additionally being diagnosed with cancer creates stressful environment that reduces adaptive capacity of affected person and her family and friends. Mental health is also greatly affected in cancer patients who often feel lonely, fear for their future and often show symptoms of depression. The elderly have greater probability to be diagnosed with cancer. In Croatia in 2017, there have been 11,156 women diagnosed with cancer. The most common cancer sites were breast, colon and lung cancer. The total number of women with breast cancer in 2017 was 2,767, of which 1,335 were over 65 and as many as 1,716 were over 60 years old. With all the difficulties aging person can face, cancer is an additional burden for older women. With all the emotions that combined age and illness bring, they often lack appropriate family care and support. Even with a supportive family, they often face resentment as they become a burden to their family, also affected with the illness of their loved one. Additional problem at that age is that there is a great number of women who are either divorced or widowed, without any fam-

ily or with very narrow social network. Unfortunately, with still existing prejudice against the elderly and cancer patients, the situation gets more complicated. Many affected women need more specific psychosocial support which they find difficult to find, especially in the environment that does not encourage them to seek such support. In 2010, Association Everything for Her opened the doors of the Centre for psychological support for women dealing with cancer. Between 35% to 40% women participating in the Centre's programs are above 60 years old. Unfortunately, estimates for those in need of support is even higher. Older women are a very diverse group and our statistic shows that they are more or less involved in all of the Centre's programs: individual psychological counselling, support groups, specialized psychoeducational programs, attending expert lectures, engaging in complementary programs such as yoga, dance and volunteering on social and cultural events. Aim of our programs is enhancing the capacity to cope with the disease, adopting useful and healthy habits, expanding the social network and improving the quality of life. Our mission is to continue learning and improving our programmes to provide the best possible care for our participants and also to raise awareness in our society and reduce stigma of cancer patients.

#### C4-P12

### Young Promoters of Healthy Ageing, Presentation of the MAMA Project, BE HEALTHY, PINK OCTOBER IN CROATIA

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In Croatia, according to data from the Cancer Registry for 2016, of the total women who have cancer 25% are breast cancer patients, 14% of colon and rectal cancer and 8% of lung cancer. From the gynecological cancers at the top lies cancer of the uterus and cervix with 9%. Croatia has three national early cancer screening programs (breast, colon and cervix) and it is extremely important to raise women's awareness of the importance of responding to free screening in all three programs. In 2019, all three national programs were included in the educational leaflet. Caring for women's health and informing them of the importance of a checkup is an important topic in society, and the Association EVERYTHING for HER would like to contribute to it. To help raise awareness for the need to

respond to national programs, and to raise awareness of the need for regular checkups for women of all ages, the Association EVERYTHING for HER has designed the "Pink October Project" to inform women in detail about ways to care for their health and early detection of primary breast cancer as well as other cancers following this. The association implemented the project "Pink October" as a pilot project in October 2017 in Glina and Hrvatska Kostajnica, and then in 2018 in 28 schools (in 2019 in 31) across Croatia. 19590 educational leaflets were distributed to mothers by their children. Activities were well received in the school and in the community. The leaflet highlights the importance of timely gynecological examinations, self-examinations and breast examinations as well as HPV vaccinations. We are extremely proud of such a responsiveness of the schools and we are sure that, through this campaign, we have all together influenced the awareness of women in different generations about the importance of preventive examinations and care for their own health. Children were instructed to give the leaflet to their mother, and the contents of the leaflet were reviewed by the Croatian Institute of Public Health. Project is being implemented to help raise awareness of women's concerns about their own health. We are witnessing morbidity in women of all ages from malignancies, as well as the often late detection of the disease, which significantly reduces the chances of cure. One of the main concerns for a sick woman at that moment is what it is like to be with children. Children can have a positive influence on parents and encourage their more responsible behavior, which is why we designed the project incorporating children as a means for communicating preventative and educational messages to mothers and other female family members, in order to encourage them to have regular check-ups.

#### C4-P13

### From CrossCare to Integrated Care – What Have We Learned From Interreg Slovenia Croatia Project

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Health care systems with rising life expectancy, declining physical and mental health among elderly, declining family members care due to family members moving abroad, has increased the need on health and social system to provide institutional and community

long-term care. Principle 18 of the European Pillar of Social Rights stresses the right to affordable long-term care services of good quality, in particular, home-care and community-based services. Institution for home care Zagreb has a long tradition of establishing innovative services in emerging area of community based health care, such as “Hospital care in home”, “Physical therapy and rehabilitation for people with disabilities in City of Zagreb”, “Palliative care coordination center” in Zagreb city and in conjunction with The dental clinic provides free dental care at home. So, the City of Zagreb with Institution for home care Zagreb has envisioned and implemented a program through a European project to provide one of the components in developing innovative integrated ecosystem while ensuring delivery of services for better quality of life among the elderly citizens of Zagreb. This Program has been developed by the consortium of partners of an Interreg program area. Leading partner, Ljubljana Home Care Institution accompanied by Municipality of Ljubljana, Center for domestic help Maribor, Community Health Center Čakovec, City of Zagreb and Institution for home care Zagreb has developed an program through collaboration of professionals (doctors, physiotherapists, nurses, occupational therapists, social workers). Hence, they took the opportunity of CrossCare project to insure a new community based service for their citizens – home based occupational therapy, which is in accordance with relevant literature in the area of cost-effective solutions for changing health system (Rexe et al, 2013). Occupational therapy has proven to be relevant to improve functionality and health outcomes in areas such as falls prevention, musculoskeletal injury, stroke rehabilitation, mental disabilities, respiratory rehabilitation and home care, all relevant to elderly citizens of Zagreb. More than 360 elderly persons have received occupational therapy services (direct one to one sessions in their home and local community) which have resulted in positive changes in occupational balance, reduced occupational deprivation and isolation, enabled daily functionality and raised their quality of life. With support of City of Zagreb this project will continue after the project stops, which ensures that Zagreb has services just like most (much richer) European countries.

#### C4-P14

## Knowledge and Attitudes Towards Influenza Vaccination Among Elderly in Eastern Croatia

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**Introduction and objectives.** According to European Center for Disease Prevention and Control data, seasonal influenza annually causes 40 to 50 million symptomatic cases in the European Union (EU), and 15 000–70 000 persons die of influenza sequelae. Most influenza-associated deaths in developed countries occur among elderly persons 65 years of age or older. At present, there is consensus among European countries regarding the routine seasonal influenza vaccination of elderly, however, vaccine uptake in many EU countries remains suboptimal. Since 2009, the EU target influenza vaccination coverage among elderly is 75% but none of the EU members achieved this target. The aim of this study is to investigate influenza vaccination coverage among elderly in Eastern Croatia and to evaluate their knowledge and attitudes towards influenza vaccination. **Methods.** This population cross-sectional questionnaire study was conducted in convenient sample of elderly (65 or more years) from Eastern Croatia at the primary health care setting during 2018/2019 influenza season. Response rate was 81.6%. **Results.** There were 48.0% males and 52.0% females. Median age of all study subjects was 73.0 years (interquartile range 69.5–79.0 years). The overall prevalence of influenza vaccination was 33.3%. The vaccination was statistically more frequent among females, old-old subgroup (85 years or older), those whose perceived socioeconomic status was better than average and those suffering from chronic diseases ( $P=0.003$ ,  $P=0.001$ ,  $P<0.001$  and  $P<0.001$ , respectively). Females, those with higher education and those who have a partner had statistically better knowledge about influenza vaccination ( $P=0.044$ ,  $P=0.001$  and  $P=0.036$ , respectively). Females, those with higher education, those whose perceived socioeconomic status was better than average and those belonging to the old-old subgroup had statistically more positive attitudes towards influenza vaccination ( $P<0.001$ ,  $P=0.023$ ,  $P<0.001$  and  $P=0.005$ , respectively). Among those with better knowledge about influenza vaccination and among those with more positive attitudes towards influenza vaccination there were statistically more elderly who were vaccinated during 2018/2019 influen-

za season ( $P < 0.001$  and  $P < 0.001$ , respectively). **Conclusions.** Bearing in mind that elderly population makes up 19.4% of the Croatian population, and the fact that elderly are one of the risk group concerning the influenza severity it is essential to strive for achievement of the EU target influenza vaccination coverage. In order to achieve this, it is important to further improve influenza vaccination knowledge and attitudes among elderly in Croatia.

#### C4-P15

### The Zagreb County – The Programme Home Care Assistance for the Elderly

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The Zagreb County is a regional (local) self-government unit in the Republic of Croatia, consisting of 9 towns and 25 municipalities. In the County's rural areas, a large number of the elderly and disabled live in single-person households. In that regard, in addition to the institutional care, the County promotes the development of the community-based non-institutional care for the elderly and disabled people, and the very Home Care Assistance for the Elderly and Disabled Programme has proved to be very successful. The Programme includes the services related to food, performing household chores, assistance in the maintaining of their personal hygiene, as well as in performing other daily activities. The Programme is intended for the elderly who have been socially isolated for many different reasons and live in the areas where there is no public transportation, live far away and do not have neighbours around, do not have heirs or their children have moved out for work, their spouses are dead, and live within an area with poorly developed social attachments, with insufficient financial resources, often of poor health. For the users of the said Services, it is essential to maintain the level of independence and remain as long as possible in their homes, within the safe environment in which they have spent their whole life. The Home Care Assistance Social Service Programme is conducted in cooperation with State institutions, local self-government units, NGOs and others seeking to reach longevity and a healthy aging. Owing to the funding of the Zagreb County and in conformity with the Social Plan and the Community Action Plan, the Social Service Programme is currently implemented in the municipalities of Žumberak, Pisarovina and Pokupsko. It is also important to mention the pro-

gramme named „Make a Wish“ (cro. Zaželi), implemented by the Red Cross town nursing centres for the elderly on the territory of the municipalities of Sveti Ivan Zelina, Vrbovec, Ivanić-Grad, Dugo Selo, Samobor and Jastrebarsko and the respective municipalities. The Make a Wish (cro. Zaželi) Programme funding is supported by the European Social Fund. The Home Care Assistance Social Service and the Make a Wish (cro. Zaželi) Programme is conducted by a team of experts, programme managers, coordinators, nurses, elderly caregivers and other assistants. With the purpose of extending the network of non-institutional senior care services, the Zagreb County will provide support to all those who want their parents, grandparents and citizens to live contentedly in their homes, according to its means.

#### C4-P16

### City of Zagreb – Dementia Friendly Community

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**Introduction.** The City of Zagreb, in collaboration with institutions and civil society, has been sensitizing the public for many years to the growing problem of Alzheimer's disease and other dementias and their destigmatization. In an effort to promote further investment and enable people with dementia to live independently as long as possible, the City of Zagreb has signed a Registration and Process Agreement on December 14, 2017 to become "Dementia Friendly Community". With registration, the City of Zagreb joined European initiative and gained title "The City of Zagreb is becoming Dementia Friendly Community". This made the City of Zagreb the first such city in Croatia. **Policy context and objective.** The agreement was signed with the Croatian Association for Alzheimer's Disease, which in 2016 became part of the international Friends of Dementia initiative. The initiative was launched by the Alzheimer Society of London, the UK's leading dementia society. In doing so, the City of Zagreb has joined a growing number of world capitals that have already initiated this process. In order to meet the criteria of the agreement and create a working plan, a working group have been established to govern the development of the "Dementia Friendly Community", which brings together key stakeholders who are necessary for successful project implementation. The working group is composed of representatives of social care centers, physicians, neurology specialists, police, city administration, public transporta-

tion, firefighters and civil society. **Targeted population.** People with dementia as citizens (not only people defined by their dementia as ‘patients’), their carers and families. **Highlights.** The working group has started with the Basic Education Program within the City of Zagreb’s “Dementia Friendly Community” development program, and in the first cycle of the education the program brought together the employees of the Zagreb Electric Tram, the Zagreb Police Department, and the Zagreb Public Fire Department.

The actors who are in frequent contact with citizens were educated, and the aim of the training was to familiarize them with the basic concepts of the disease, how to identify a person with dementia and how to approach such a person. In addition to educating key actors who are in daily contact with citizens, an important segment that should be addressed is the care and care facilities for older people, such as hospices, nursing homes, and day care centers. With this in mind, the working group is in preparation of a handbook for “Dementia F”.

#### C4-P17

### Skin Cancer Has Become a Public Health Problem

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All over the world, the incidence and mortality rates of skin cancer have significantly increased over the last few decades and thus have become a public health problem. Despite increased public awareness of the risks of skin cancer and even though skin cancer is one of the most preventable malignancies, the incidence continues to rise worldwide. Ageing changes in skin are caused by intrinsic factors, which are genetically determined and extrinsic factors, which are environmental. Intrinsic or chronologic ageing leads to thinned epidermis, reduced pigmentation and fine wrinkles. By far the most common extrinsic factor is ultraviolet (UV) exposure which is referred to as photoageing. More than 90% of skin cancers are found in the areas of the body which are exposed to UV radiation. Both sun and indoor tanning devices are risk factors for the development and growth of melanoma and nonmelanoma skin cancers. Important determinants of both the degree of risk and the type of skin cancer are the various forms of UV spectrum and timing of sun exposure. The intermediate levels of cumulative or constant UV light exposure during lifetime are common in lifelong outdoor

occupational exposure and result in development of actinic keratosis and squamous cell carcinoma. They occur in older population who had time to accumulate DNA damage in cells and in light-sensitive individuals with skin phototypes I and II who have less pigmented skin and a higher tendency to burn easily. On the other hand, intense intermittent UV exposure and particularly sunburns that occur in childhood and youth cause basal cell carcinoma (BCC) and cutaneous melanoma (CM). BCC tends to develop after the age of 50, however early onset of BCC is on the rise and results from frequent use of tanning devices. CM can occur at any age, especially at risk are everyone with a family history of melanoma or a personal history of bad sunburns. Avoiding overexposure to direct sunlight during the peak daylight hours to prevent sunburns, wearing protective clothing, and applying broad-spectrum sunscreen with a sun protection factor of 30 or higher are ways to protect the skin. Primary care physicians play an important role in skin cancer prevention and should be familiar with recommendations on behavioral counseling and sun-avoidance strategies, especially for patients with a history of personal or family skin cancer. Due to cumulative effects of UV radiation, appropriate age groups to target for sun protection intervention are children and young adults because only change in their behavior will result in decreased incidence of skin cancer and healthy skin ageing in later stages of life.

#### C4-P18

### Healthy Ageing as a Part of the National Mental Health Development Strategy 2019-2030

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Ministry of Health Commission for Developing National Mental Health Strategy 2020-2030 drafted the document during 2018 and 2019 year. The purpose of the strategy is to improve the existing ones and to develop new models of promotion, improvement and protection of mental health in order to reduce the occurrence of mental disorders and disabilities associated with them, and increase the availability of adequate care in the territory of the Republic of Croatia. The strategy is based on relevant international UN, WHO and EU documents and on the guidelines of the Twin-

ning project: “Ensuring optimal care for people with mental disorders.” The specific objective of the strategy is to protect the mental health of vulnerable groups, with particular attention to the elderly population with specific care needs. There is need for early recognition and treatment for mental disorders in elderly as well as prevention. Numerous studies have confirmed the importance of social integration as a factor in mental health: people with more frequent contact with family, friends and neighbors, people married, people involved in religious life or civic organizations or clubs are generally better at mental health than people who are more isolated. People who live in societies or communities that are better socially integrated and provide security for their members, as well as a quality and organized living environment and housing, will have a higher level of mental health. Accordingly, measures, drafted in Strategy, related to the protection of the mental health of the elderly include: conducting research and activities aimed at combating the stigma of vulnerable groups; participation in the promotion of active aging programs; encouraging activities to prevent violence against the elderly; actively supporting the development of mental health in old age, focused on individualized care, day care and local community care; promoting and supporting the families and carers of persons with mental health problems; prevention of deprivation of legal capacity through education of all participants in the process of deprivation of legal capacity; improving the professional competencies of healthcare professionals and associates in health and social care settings working with the elderly; developing the use of volunteering to assist the social inclusion of people with mental disorders. The strategy foresees the adoption of a special action plan for people with dementia.

#### C4-P19

### IMPULS for 54+

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The Impuls for 54+ project increases the social inclusion of people older than 54 from geographically isolated and deprived areas of Medimurje County using cultural and artistic activities as impulses for their activation. The project activities have enriched the quality of life of the involved people over the age of 54 and enabled their social inclusion. The mentioned group of people, for various reasons, have very limited access to cultural and artistic activities. Their issues are living in remote, geographically isolated rural areas with low financial income and limited mobility because they don't own or can no longer drive their car. They find it diffi-

cult to move and need assistance for a difficult trip. Some of them live in single households and are uninformed about the cultural and artistic content available to them in their community, especially the content made to suit their interests/needs. They require free and accessible cultural and artistic content appropriate to their intellectual and perceptual capabilities – content in local expression that they can understand and comprehend. To strengthen their skills and enrich their quality of life, the offered content must also be highly stimulating. In response to the aforementioned issues of elderly people in Medimurje county, we have designed participatory cultural arts workshops in 4 areas. The elderly will be able to play the tambourine, sing, practice folklore dances and read in workshops as well as present art projects made by themselves at public performances and participate in cultural and artistic appearances (opera, performances, concerts). It is important to note that all the workshops have a strong local expression (Medimurje folklore / customs, local composers and writers). Transit, presenting the main obstacle to the elderly from participating in cultural and artistic activities in their community, will be organized. The aforementioned contributes to a more active participation of target group members in cultural arts workshops enhancing their social, cognitive, emotional and creative skills. The artistic projects designed and presented by the target elderly group members to the general public will increase their visibility and potential, therefore indicating the need for greater involvement of the elderly into the community and society in general. The project has been approved for funding under the call for Arts and Culture for the elderly and has been funded with 100% European Union funding by the European Social Fund.

#### C4-P20

### Projects Related to Ageing in Horizon 2020, Framework Programme for Research and Innovation

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**Introduction and objectives.** The current population share of people in the age group of 75+ in EU28 in 2019 is 9.5% and has grown since 6.8% in 2001. Share increase in this age group is even bigger in less per-

forming countries such as Croatia (9.45% in 2019 and 5.3% in 2001), intensified additionally by emigration. Ageing population represents an evolving concern in many aspects of life. It influences economy, demography, intergenerational relationships, living arrangements, health care approaches and unsustainable health-care costs. All of these challenges triggered an increased interest in research of ageing in many disciplines. Advancement in medicine generated a plethora of new diseases among the ageing population that were not known before, comorbidities being among the most challenging ones. Here we present the growing interest in the health research on this subject funded in EU programmes. We aim to determine the proportion of research on ageing within Horizon 2020 programme / Societal Challenges/Health (SC1). **Methods.** We searched the Calls for Proposals, projects and their results in the European Commission databases “Funding and Tenders” (<https://ec.europa.eu/info/funding-tenders>), “Cordis” (<https://cordis.europa.eu/search/en>), H2020 Dashboard (<https://webgate.ec.europa.eu/dashboard/sense/app/93297a69-09fd-4ef5-889f-b83c4e21d33e>) and others. **Results.** In Horizon 2020 Work Programme 2018-2020 – Health, demographic change and wellbeing (SC1) word “Ageing” is mentioned ninety-six times. Twenty-nine calls were dedicated to ageing (out of 295) and approximately one third of the funded projects are related to ageing (341/1039). We will present the number of projects, EC contribution and results coming out from these projects; publications together with their content analysis and intellectual property rights. We will show main areas of research, top funded projects, and geographical distribution of the participants. **Conclusions.** Age-

ing is a growing issue in various aspects and research fields. While research on ageing is present in the Horizon Framework Programme, the projects are scattered through various calls. The system for the monitoring of allocated funds, research topics, project results are overwhelming, but not harmonized nor easy to find. Based on the importance of ageing, but also other inter- and multi-disciplinary research fields, the systematic approach to tackle these issues are needed.

#### C4-P21

### *My Golden Split*

Magda Vrvilo

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“My golden Split” is project of city of Split for retired citizens in their golden years. Goal of this project is to help citizens, have better control of allocated funds and build a rightful system with social norms. Every month users get money from City of Split on their bank card which can spend in markets. Owners of this card can use different discounts for museum tickets, theatre tickets, sport matches, libraries etc. Main social norms to get card: total revenues under 2.000 kunas and owning only one property. Monthly, users get from one hundred to three hundred kunas on card. With this local government’s project we hope to improve the quality of life and get more active use of social contents. Split is city on the sea and basic motive on the card – water anchor symbolizes choice of our citizens to stay in the city – calm and safe port.

## Session C5: Healthcare System Organization in the Advent of Chronic Diseases Caused by Ageing

### Invited lecture

#### C5-I

### Can the Health System Be Better Organized to Meet the Challenge of Chronic Diseases and Ageing Disorders?

José M<sup>a</sup> Martin Moreno

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It is not difficult to understand how complex it is and will be for Europe to deal with one of the highest rates of ageing and chronicity in the world, nor to change the trend that confirms that around 90% of mortality in our country is due to chronic diseases.

Nor will it be easy to care for the growing number of Europeans with senile dementia and Alzheimer's, or even to halt the growth of obesity in adults and children, which will mean even more diabetes, cardiovascular disease and cancer.

In short, we face more chronic diseases and greater stresses on the sustainability of health systems.

If we focus on financing, a scenario of inertia due to inaction projects that the health budget will have to grow by around 45% by 2020 in order to meet the demand for care, which does not seem bearable for our economies. Hence the need for an orderly transformation of the care model that makes the sustainability of our health systems possible.

However, although there has been much talk of this in Europe in recent years, understanding the need to meet the challenge of chronicity, there seems to be a lack of energy and leadership to make something really effective happen to improve the situation.

In fact, in the context of the economic crisis, health systems have been managed with a multitude of actions to cut spending in a linear fashion, but without any real willingness to lead the necessary transformation of the health system to focus on the management of chronic patients. This is despite the fact that the transformation of the model is the only way to generate potential savings and improve quality in the health system.

One of the main reasons for the lack of transformative leadership is the current paradigm of what medicine is, focused on rescue, on the acute, on attending

to the specific episode. Medical schools explain this, and practices are done in huge super-specialized third level hospitals. In addition, political logic is also caught up in it. Political leaders have fallen into this logic of immediacy by "rescuing" health care. They deal almost exclusively with "acute" health problems, moving from one crisis to another without thinking about the chronic structural problems of the system that require a medium-term transformation.

Thus, in the same way that it is necessary to complement clinical care for acute patients with a model more in line with the care of chronicity, in parallel it is necessary to complement a policy or management of health rescue with a management of medium-term transformation.

To achieve a good performance within the system, it is necessary to effectively transform the care model and manage the chronically ill more efficiently. There are also numerous similar examples in Europe and Spain with positive results in terms of potential for improving quality and sustainability. For example, the TELBIL study, carried out within the framework of the Basque Country's Chronic Care Strategy, shows that a model of telemonitoring of complex chronic conditions from primary care onwards achieves a substantial reduction in hospital admissions and stays. In Sweden, the county of Linköping systematically achieves better health outcomes and efficiency than other countries thanks to this type of intervention.

Moreover, these profound changes in the sector cannot be achieved without the participation and involvement of health professionals. The examples of good results cited above are not only a technological achievement, but have been achieved through the active participation of health professionals. The more health professionals are involved in management and organizational issues, the better the quality and efficiency re-

TABLE 1. MANAGEMENT RESOURCES TO LEAD THE NECESSARY REFORM OF THE HEALTH SYSTEM IN ORDER TO FACE CHRONIC DISEASES AND AGEING DISORDERS

- Transforming passive patients into active patients,
- Introducing new professional roles for case management.
- Articulation of integrated care pathways.
- Technologies that allow for the provision of services at a distance (e-health, m-health). Incentives and disincentives to reduce hospital admissions and readmissions.
- New forms of stratification of the population by risk (which allows better targeting of preventive or care interventions).
- New clinical decision support systems.
- New forms of recruitment aimed at contracting value rather than just activity.

sults obtained in an organization. The literature on the involvement of health professionals (medicine, nursing, pharmacy, etc.) confirms that it is no longer sufficient for clinicians to be excellent clinicians, but that active participation in management and organization is necessary to achieve good results. ASPHER may and should help preparing health system professionals to be better prepared.

Along with all of the above, it is essential to lead this transformation. The current fragmented model does not provide the quality, clinical safety and results expected, especially for chronic patients. It is increasingly understood that better management of these patients is not only a clinical challenge, but also an organizational and management challenge.

We must use tools to turn passive patients into active patients, which are already well known. This battery of tools allows the care model to be organized in a different way. The key will be to implement them in an aligned way.

In conclusion, there are effective resources and procedures that make it possible to transform health care to offer more quality to the chronically ill while making it more sustainable. To achieve both objectives, it now seems more logical to transform than to cut.

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## Oral presentations

### C5-O1

## Clemson University-Medical University of South Carolina Rural Health Innovation Partnership to Improve Health Outcomes & Equity in South Carolina, USA

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**Introduction and objectives.** South Carolina (SC), located in the southeastern region of the United States, is a state of nearly 5.1M people with about 32% at age ≥55 years. SC is not a wealthy state and the majority of its 46 counties are designated rural. Many of these rural SC counties suffer from a broad range of social determinants of health (e.g. high unemployment and poverty; lower income and education levels), a state-wide maldistribution of health professionals and facilities, poorly controlled chronic disease, a noteworthy proportion of uninsured or underinsured individuals, and health outcomes that dramatically impact healthy ageing. In this presentation the authors will provide: 1. Context for the rural health innovation partnership, 2. Comparison of health outcome data in target SC regions, 3. Overview of initial planning and implementation, 4. Planned state-wide expansion. **Methods.** We will provide a high-level overview of a rural health innovation partnership that will engender healthy ageing. This includes leadership commitment, county and region-wide health outcome data analysis, legislator and key stakeholder buy-in, joint pilot study programming, early successes, and lessons learned. We conducted a pilot study of four existing health programs employing mobile health vans, health extension agents embedded in agriculture offices and other community resources. Health extension agents began offering community-based classes in diabetes prevention and hypertension control. Partnership staff leveraged health outcome data and county-wide health outcome methodology that guided planning for regional program expansion. **Results.** The State legislature and the Medical University of South Carolina (MUSC) Health System (non-profit) provided seed funding for the Clemson University-MUSC rural health innovation efforts. MUSC Health also acquired four rural hospitals in spring 2019, in communities hampered by social determinants of health and poor

health outcomes. After > 18 months of pilot study collaboration, the partnership was formally launched (fall 2019) as Healthy Me – Healthy SC (HMHSC). With HMHSC came a commitment to regional partnership expansion using a hub & spoke model in rural communities, aimed at reducing unnecessary hospitalization, reducing cancer mortality, and reducing the premature death rate. Our presentation outlines key steps, lessons learned, and strategies to improve health outcomes and equity to support rural healthy ageing. **Conclusion.** The HMHSC partnership enhances healthy ageing in rural environments by supporting health services with innovation aimed at improving chronic disease burden and reducing premature death.

## C5-02

### Formation of Endovascular Stroke Service Network in Croatia

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**Introduction and objectives.** Stroke is a third leading cause of avoidable deaths in European Union and leading cause of disability. Mechanical thrombectomy, a minimally invasive endovascular technique is a leading method of treatment in patients with ischaemic stroke caused by occlusion of a large vessel, and has become a one of the most effective medical therapies available (1 in 2.6 patients are helped, ie less disabled at 90 days). So, it is of paramount importance to make this technique available to all EU citizens, especially in countries with high stroke and death from stroke rates, such as Croatia. **Methods.** Interventional neuroradiology (INR) practice has been established at University Hospital Centre Zagreb in 2003, dealing primarily with haemorrhagic stroke. First patient with ischaemic stroke was treated with intra-arterial thrombolysis in 2007 and since then treatment techniques have been improved and more and more patients treated. In 2015 when mechanical thrombectomy has been established as effective therapy by multiple randomized trials, it became evident that INR service centralized in country's capital will not suffice and that established means of transport will leave many patients outside diagnostic and therapeutic window of 6 hours. Our Department proposed a plan to Ministry of Health and Croatian Health Insurance Fund to establish a national stroke service network by training neurologists, interventional radiologists, nurses and technicians

from university hospitals in other 3 major Croatian cities, together with out-hospital emergency personnel, that started with the beginning of 2018. **Results.** In early 2020 mechanical thrombectomy is performed in 4 university hospitals (2 in Zagreb, also in Split and Rijeka) and teams from University Hospital Osijek are under training. In 2019, about 300 patients underwent endovascular stroke treatment in two clinical hospitals in Zagreb, 80 in Split and 50 in Rijeka, but that is still halfway to achieve a target rate of 5% of all stroke patients that should be treated every year, as suggested by European Stroke Organization. **Conclusions.** Good planning and effective training are responsible that endovascular stroke treatment is today available to ¾ of Croatian population reducing mortality and permanent disability, but sustained effort is needed to cover the rest of the country and to maintain quality of outcome.

## C5-03

### Healthy Ageing Through ICOPE and the Implementation of Lifestyle Interventions for Diabetes Prevention

Hermes Florez

Miller School of Medicine, University of Miami, USA

Addressing challenges associated with increased lifespan and growth of the older population globally, our team seeks to enhance the implementation of evidence-based interventions to reduce the burden of obesity and related conditions, such as diabetes, which are also growing worldwide especially in minority older adults with less access to care. We proposed to use the World Health Organization – Integrated Care for Older People (ICOPE) in a pilot study in South Carolina (SC), a state experiencing increased disability in the population associated with large prevalence of obesity and diabetes. We will use ICOPE health assessments of mental and physical function to adapt lifestyle interventions from the US Diabetes Prevention Program and the Look-AHEAD studies that have shown improvement in the quality of life and potential reduction of disability in people with or at high-risk for diabetes. Lessons learned promoting healthy longevity with our multidisciplinary team in SC could be applied in other populations, using easy to implement prevention strategies, overcoming challenges of access and potentially reducing healthcare costs, while we improve physical, mental, and social well-being for people as they age. The partnership of academic and public health leaders with the community and policy

makers will facilitate the future adoption in the State Plan on Aging and help us fulfill the promise of healthy longevity in SC and beyond.

## C5-O4

# European Union Legal and Policy Instruments for Improving Treatment and Prevention of Chronic Disease

Tomislav Sokol

European Parliament

Ageing of the population is a major issue in the European Union. As such, chronic diseases related to this phenomenon will put a major strain on the organisation and financing of national health care systems in Europe. In this context, it is important to stress that health care in the European Union belongs to the primary competence of the Member States. This is prescribed by Article 6 of the Treaty on the Functioning of the European Union (TFEU), according to which the EU may carry out actions to coordinate, support or supplement the actions of the Member States related to the protection and improvement of human health. Furthermore, according to Article 168 of the TFEU, EU action must respect the responsibilities of the Union Member States for the definition of their health policy and for the organisation and delivery of health services and medical care. These responsibilities include the management of health care services and the allocation of the resources related to them. However, this does not mean that European Union is powerless to improve treatment and prevention of chronic disease affecting the population of the Member States.

The aim of this presentation is to lay out legal and policy instruments the EU has at its disposal to tackle the issue of chronic disease. It will show that these instruments can be divided into two major groups: regulatory and financial ones. Some of the regulatory instruments, like proposed regulation on health technology assessment, are already in the process of being adopted through ordinary legislative procedure. Additionally, existing legislation like the Transparency Directive and Directive on Cross-border Health Care have shown many deficiencies and are ready to be amended in the coming years. Financial instruments, including Horizon Europe, cohesion policy and InvestEU, may also provide an important added value for improving quality and accessibility of health care provision in the European Union.

## Poster presentations

## C5-P1

# Balneology for Healthy Aging

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People in the world are living longer, and the number of older adults in the population is growing. 10% of the total population in the world are aged 65 or over, and this figure is expected to be over 16% in 2050. The European Union recognized the importance of the problem and named 2012 the European Year for Active Ageing and Solidarity between Generations. It also indicated that active ageing is not only about a higher quality of life for individuals, but also offers many benefits for the whole of society. Anti-ageing medicine is another popular concept related to ageing. It focuses on stopping the ageing process, with the efforts aimed in turning back “to the young age”. All around the world is mostly the subject of plastic surgery, cosmetic medicine and complementary and alternative medicine. Balneological treatments have been being used widely in many countries for treating certain pathologies mostly the rheumatic diseases for centuries and could be a tool for healthy aging. Balneology implements treatment methods developed in balneology and physical medicine. Modern balneology aims to combine tradition with modernity. Balneology might be an effective tool in the prevention, treatment and rehabilitation of the diseases that occurs frequently in elderly. And finally, balneotherapeutics may complement and support other treatment options for elder population. Literature search by keywords “balneology and aging” provided several studies that uses balneotherapy, hydrotherapy and physical therapy for treatment of elderly people with some chronic diseases. Studies monitored effects of balneotherapy on knee osteoarthritis, low back pain, musculoskeletal diseases and osteoarthritis. All studies showed improvement of patients, reducing pain, positively contributes to functionality and quality of life. Balneotherapy is an effective treatment modality in elderly patients with osteoarthritis of the knee and low back pain, and its benefits last for at least 3 months after treatment. The evidence on the positive effects of balneological factors and interventions on the elderly people indicates that balneology and spa tradition could be a tool for healthy ageing.

## C5-P2

## Value for Money in Spending on Pharmaceutical in Croatia

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**Introduction and objectives.** Spending on pharmaceuticals in Croatia makes up a considerable share of total healthcare expenditure under the mandatory and voluntary health insurance (at least 23% but depending on the costs included in the calculation, it could reach almost 30%) as well as about 1.5% of the GDP (2019). A large share of pharmaceutical expenditure is devoted to treating chronic diseases whose incidence and prevalence increases with age. Since the Croatian population is aging, the trend of healthcare spending on chronic diseases, including medicines, is expected to grow. One the other hand, innovative technologies designed to elevate the burden of chronic diseases are becoming increasingly more expensive. Since the Croatian healthcare budget is limited (i.e., less generous than many other EU members and already bearing arrears amounting to several million Euro), it is important to analyse whether and how the “value for money” is being considered in medicines’ pricing and reimbursement decisions. **Methods.** Policy documents related to the process of medicines’ pricing and reimbursement were reviewed, as well as publicly available data on medicines expenditure in Croatia. **Results.** A closer look at the health financing situation reveals trends that could cause concern if not addressed in due time: while significant funds flow into curative care, there is not much information on quality of care and “value for money” spent on different interventions, including medicines. Value-for-money analysis of medicines proposed for reimbursement, such as cost-effectiveness analysis, is not requested as a part of the submission dossier nor is it conducted by the bodies involved in pricing and reimbursement decision-making. Health economic assessment is limited to Budget impact analysis focusing only on HIF’s costs. Value-for-money analysis requires high-quality, reliable and available local epidemiological, outcomes and costing data – all currently unavailable in Croatia (e.g., no patient registries or real-world outcomes data) with few clinical trials conducted to facilitate the provision of local outcomes data. The appraisal process is not guided by formal multi-criteria decision analysis nor are the conclusions of formal appraisals publicly available. Although HIF manages a limited budget, there is no process of prioritization when appraisal recommendations or reimbursement decisions are formed nor do these rely on a broader set of healthcare funding priorities. Priorities seem to be internalized in the reimbursement decisions with no formal criteria.

Value-based pricing is currently not implemented with few managed entry agreements tying treatment outcomes to prices and payments.

## C5-P3

## Health of the Elderly in Croatia at the Primary Healthcare Level in 2018 Seen Through the Croatian Central Healthcare Information System (CEZIH)

Željka Draušnik, Vesna Štefančić Martić, Sandra Mihel, Ana Ivičević Uhernik, Urelja Rodin, Mario Trošelj, Ivan Cerovečki, Danijela Fuštin, Ranko Stevanović

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**Introduction and objectives.** There is a hypothesis that primary healthcare usage in Croatia is higher among the elderly compared to other citizens. The Croatian Central Healthcare Information System (CEZIH) is predefined by the Healthcare Data and Information Act and its main role is the storage of the data and information for standardized processing at the primary, secondary and tertiary healthcare level. General practitioners (GPs) that have a contract with Croatian Health Insurance Fund, regularly exchange e-messages with basic data on patients and exact visits (incl. diagnoses, diagnostic therapeutic procedures, referrals and prescriptions). All the other healthcare providers are also obliged to ensure a certain level of medical data exchange through CEZIH. The objective of this paper was to present the health of the elderly in Croatia at the primary healthcare level through the analysis of the data from CEZIH. **Methods.** The data for 2018 were collected through CEZIH and analysed with a special focus to elderly (aged 65 years and more) and the use of primary healthcare services, number of contacts with GPs (check-ups, visits, phone calls, counselling, etc.), referrals and prescriptions. **Results.** In 2018 there were 42.513.507 contacts with GPs registered in Croatia. Elderly aged 65 or more had 17.549.551 contacts with GPs (41,3% of total number of GPs contacts), almost 21 contact per person on average (1,7 times more than the average for the population aged 64 and less who had 12,5 contacts per person). Among the elderly, the total number of contacts decreases with the increase in age groups: age group 65-74 (51,6% of all elderly) had 8.420.053 contacts (19,8% of total number of all GPs contacts), age group 75-84 (36,1% of all elderly) had 6.948.351 contacts (16,3% of total number of all GPs contacts), age group 85 or more (12,3% of all elderly) had 2.181.147 contacts (5,1% of total number of all GPs contacts). The elderly acquired 3.851.002 referrals (on

average 4,6 per elderly person) mostly for the diagnostics tests (43,5%) and acquired 26.805.886 prescriptions (on average 32 per person), mostly for beta adrenergic receptor blockers. **Conclusions.** Data available through CEZIH show that elderly in Croatia acquire more than 41% of all GP contacts. The connection of the data at the individual level through CEZIH creates many possibilities for further data analysis and provides great potential for creating prerequisites for improving the development of health indicators for the elderly. These indicators are necessary for a creation of evidence-based public health policies for elderly in Croatia.

## C5-P4

### Self-Reported Unmet Needs for Health Care Among Urban and Rural Elderly Population in Croatia

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**Introduction and objectives.** Aim of this research was to analyze self-reported unmet needs for health care among urban and rural elderly. **Methods.** Data from the European Health Interview Survey wave 2 conducted in Croatia in 2014/15 on a sample of 5,446 respondents aged 15 years and older, out of which 1,453 were 65 years old and older, were used for analysis with weighting applied in order to achieve representativeness of the results at the national level. **Results.** Unmet needs for health care were higher among elderly (aged 65 years and more) compared to younger population (15-64 years) for all analyzed causes – long waiting lists (27,7% vs. 19,2%), distance from health care providers including transportation problems (8,3% vs. 3,7%) and financial constraints (10,5% vs. 6,8% for medical care, 7,3% vs. 5,1% for dental care, 8,3% vs. 4,7% for prescribed medication). When compared to the elderly living in urban settings, rural elderly reported more unmet needs due to distance from health care providers including transportation problems (9,6% vs. 7,3%) as well as more financial constraints in approach to prescribed medication (8,9% vs. 7,8%), but also reported less unmet needs due to long waiting lists (19,0% vs. 34,2%) as well as less financial constraints in use of medical care (8,7% vs. 11,8%) and dental care (4,3% vs. 9,3%). **Conclusions.** Elderly in general reported more unmet needs for health care compared to the rest of population which

points out the importance of focusing on health needs of this particular age group. More problems due to distance and transportation reported by elderly living in rural settings, emphasize the need to improve options for transportation and increase availability of health care providers in rural areas. More unmet needs for health care due to long waiting lists as well as more unmet needs for medical and dental care due to financial constraints among urban elderly might reflect the existence of the real greater unmet needs of that population, but they could also be influenced by differences in perception of their own needs for health care among urban and rural elderly. Unmet needs for prescribed medication due to financial constraints could be considered as more objective indicator as medication had to be prescribed by medical doctor and is not to that extent influenced by differences in self-perception of their own needs, which points out again a less favorable position of rural elderly. Considering the health and social care needs of the increasing numbers of elderly in Croatia is the prerequisite of ensuring that all people and communities receive the quality services they need without financial hardship.

## C5-P5

### Role of Non-governmental Organizations in Public Health and Healthy Ageing on the Example of the Andrija Štampar Association of People's Health

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Europe is facing demographic changes causing the need for different solutions in long term care. Healthy ageing is the process of developing and maintaining the functional ability that enables wellbeing in older age. That also means easing the burden on healthcare and social care systems. Governments are still not including enough of non-governmental organizations (NGO's) as partners in creating healthy aging policies. There are different ways in which NGO's contribute to healthy ageing process. Some of them organize various workshops and activities in which the elderly participate and thus directly promote health, some of them teach people through various forms of educational activities and raise awareness of the importance of health promotion. Some serve as a place to maintain or create social interaction at an older age, which is extremely

important in maintaining health. They all play a significant role in the design and testing of various health promotion programs. Furthermore, working directly with the elderly provides them with an irreplaceable end user feedback. We recognized the need for interventions and potential of NGO's in Croatia and founded Andrija Štampar – Association of People's Health in 2009. Since then we have organized free counseling and lectures for the general population, many workshops and public health actions to raise awareness of the importance of disease prevention and health promotion and increasing responsiveness to national prevention programs. By designing, organizing and implementing numerous projects, we have formed a network of experts in the field of public health and healthy ageing. Our next step is the creation of an Advisory Center for synergistic cross-sectoral cooperation, an institution that brings together experts in different health-related fields who could advise, influence and create new standards in public health activities, especially tackling the hot topic of healthy ageing. Through their work and successful projects, NGO's necessarily create a network of quality experts. It is extremely important to harness this knowledge and experience and transfer it into the broader framework of policy, regulation and law formation. By doing so, we could significantly improve the healthy ageing process.

## C5-P6

### How to Live Longer Well with Alzheimer's Disease

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Alzheimer's disease is pretty common today among elderly. Almost one third of people in future will be concerned old, and the age is the most common risk for developing dementia, e.g. Alzheimers. Today the society is aware of neurocognitive disorders and people are diagnosed much earlier than before. So, while persons are diagnosed earlier they also spend more years with the fact that they have Alzheimer's disease. For sure, if the people with dementia (PwD) do not have post-diagnostic support their life will not be easy. Modern management of dementia considered multi-professional approach involving also non-pharmacological treatment. Of course, PwD need standard treatment with antidementives, but various individually tailored therapies like art, music, dance, pat, occupational etc. therapies are essential. For PwD the best thing is that they remain at work and at home as long as possible. That means that they will need adequate understanding and support in their surroundings to be capable to act

in this setting. Among every family, if possible, the informal caregiver should be recognised and this person should be trained and advised. This can be done in academic or NGO settings. Also, family doctors should advice carers to think about themselves due to avoid burn-out syndrome, and to protect their health. When the stage of dementia progresses PwD would be advised to attend the Day care centre. Nursing home should be considered for PwD with advanced dementia, if palliative mobile teams are not available. All these strategies should be planed and available in different parts of country and this is only possible if the national action plan/strategy to fight dementia exists and is implemented. In Croatia, we are still lacking such kind of official state plan although there is an initiative of Croatian Alzheimer Alliance (HAA) for several years ago. HAA has now 31 members, e.g. different societies or NGOs who are working for better life of PwD and supporting the need of developing national dementia strategy. A lot of dementia friendly activities have already been developed in Croatia, but this is still the beginning. Much more can be done in the future for better life of PwD and their families.

## C5-P7

### EU Financial Period 2021-2027 Is Approaching – Is Croatia Ready for the Negotiations and Projects?

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**Introduction and objectives.** The beginning of Croatian negotiations for the EU financial period 2021-2027 is approaching. The new Cohesive policy puts emphasis on five policy objectives set as investment priorities. For health care, the most important is "a more social Europe", founded on the European Pillar of Social Rights. Due to the population ageing, increasing life expectancy and burden of non-communicable diseases, the enabling condition pertaining to health care priorities is a defined strategic policy framework for health and LTC. The fulfillment criteria include mapping of health and LTC needs, ensuring efficiency, sustainability, accessibility to services and measures to promote home and community based services. The aim of this research was to analyse capacities of the Croatian health care sector for LTC needs mapping and priority setting for the new

EU financial supports. **Methods.** Desk research, as a suitable first tool in policy analysis, was conducted for assessing Croatia's readiness for the upcoming negotiations concerning EU fulfillment criteria for the enabling condition for health. Three topics were in focus of the research: consistency of the terminology within the existing national strategic documents; availability of population needs assessment data and appropriateness of the information about health system performance. **Results.** Current national strategic policy framework for health includes National Health Care Strategy 2012–2020, Strategic Plan for Human Resource Development in Health Care 2015–2020 and Strategic plan of Ministry of Health 2020–2022. Terminologically, LTC was not recognized as a distinct entity but some of the existing services suit LTC definition. For reporting state and trends of health and health care routinely collected data were used. Structure and output indicators, referring to system performance and health outcomes were set. Process indicators were not set. Population needs, including LTC, were not shown. The connection between needs analysis and selected priorities was mostly unclear. **Conclusions.** Current national strategic framework for health is not in line with the new EU fulfillment criteria for health. Since the time frame of national strategic policy framework for health is near its end, there is an opportunity to make needed adjustments, namely mapping of health and LTC needs. Routine collection of population and health data which can serve as a basis for required health and LTC mapping is in place. Croatia being one of the countries taking part in the development of the methodology for the mapping as a part of EC Health Infrastructure Mapping project should be considered as an advantage.

## C5-P8

# Age Distribution and Clinical Outcomes of Hospitalized Patients in General County Hospital Požega

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**Introduction and objectives.** Healthcare systems are facing challenges related to sustainability, and costs become higher from year to year. New costs may be

associated with new therapeutic options and diagnostic challenges, but mostly with demographic changes associated with an aging population. According to the 2011 census report, there were 17,94% of those over 65 years old in Požega-Slavonia County. In total of 10016 hospitalizations during 2019 at General County Hospital Požega, 4134 referred to age of over 65, representing 41,27% of total hospitalizations. Considering this difference, we decided to investigate whether there was a difference in the length of hospitalization between the older and younger than 65 and whether there was a difference in clinical and treatment outcomes. **Methods.** In the study, we used hospital information system data, analyzing the total number of hospitalized patients in 2019. We distributed the number of hospitalized patients according to the determined age distribution in 5 age groups. Under 18, 18 to 30 years old, 31 to 50 years old, 51 to 65, and finally, older than 65. The length of hospitalization based on age was analyzed and treatment outcomes determined by the system for healed patients, unchanged outcome, improvement, worsening, and death. Kruskal Wallis test was used for statistic analyze. **Results.** There was a total of 10016 hospitalizations during 2019 at General County Hospital Požega, without gender distribution. There were 836 hospitalizations of younger than 18, 1182 hospitalizations 18 to 30 years old, in range of 31 to 50 years old there were 1575 hospitalizations, 2289 hospitalization of people aged 51 to 65, and 4134 hospitalizations at age older than 65 years. There was no significant difference in duration of hospitalization depending on age. Duration of hospitalization in younger than 65 was 4,73 days, and 5,98 days in older than 65 ( $p=0,514$ ). Treatment outcomes determined by the hospital information system show better outcomes within younger than 65, such are healed patients outcome 48,84% ( $p=0,001$ ). In older than 65 there were statistically higher prevalence of death clinical outcomes 9,24 % ( $p=0,001$ ). There was no statistical significance in outcomes such as unchanged condition and improvement of clinical condition. **Conclusion.** Hospitalization length does not depend on patients age, therefore health care costs are not related to the length of hospitalization older than 65 years. Increased mortality in the elderly should be considered in light of demographic characteristics, and not as separate information.

## C5-P9

## Propensity Score Matching to Determine the Impact of Metformin on Mortality in Older Veterans with Diabetes

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**Introduction.** Diabetes (DM) is associated with an accelerated aging that increases morbidity and mortality. Data from the UKPDS showed that metformin may lead to lower risk of overall mortality in middle aged adults with type 2 DM (T2DM) but the evidence is less clear in older adults. The study aim was to determine whether metformin is associated with reduced mortality in older US Veterans with T2DM compared with other antidiabetic medications or insulin. **Methods.** Retrospective comparative cohort study analysis using propensity score matching (PSM) to control for confounding by indication. From June 30, 2011 to June 30, 2014, community dwelling Veterans aged 65 years and older with T2DM who had new prescriptions for metformin were matched with those with new prescriptions

for insulin and other oral antidiabetic drugs (OAD) using PSM with one-to-one nearest neighbor matching without replacement and followed until June 30, 2019. Matching covariates used to calculate the propensity score included baseline age, gender, race, level of glyce-mic control, DM duration and complications, BMI and frailty with a tolerance level of .02. At the end of follow up, data on all-cause mortality was aggregated and the association of metformin vs. insulin and OAD with all-cause mortality was determined using a Cox regression model. **Results.** A total of 352 Veterans with T2DM were included in the study (176 taking metformin and 176 taking insulin or OAD). After matching, all the baseline clinical characteristics were comparable between the two groups. Patients were 80.1% White, 89.2% non-Hispanic, 97.4% male, mean age was 69.18(SD= 7.69) years. Over a median follow-up period of 2151 days (IQR=685.75), 112 deaths occurred (met-formin n=43, insulin and OAD, n=69). Compared with those taking insulin/OAD, Veterans taking metformin had a lower mortality risk, adjusted hazard ratio (HR)=.57 (95%CI:.39-.84), p=.005. **Conclusions.** These results suggest that metformin may reduce all-cause mortality in older Veterans with diabetes. Further studies may be needed to assess the impact of metformin on quality of life and potential benefits on specific morbidity and mortality in this population.

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**BETTER FUTURE of HEALTHY AGEING 2020**

## **Students' Posters**







## A Review of Public Health Project: *Zaželi – Program Zapošljavanja Žena*

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**Introduction and Objectives.** The demographic picture of Croatia shows two trends: decreasing population and population ageing. As a consequence of these trends, the increasing social and economic burdens are placed on the National Budget. The EU-funded project „Zaželi – program zapošljavanja žena“ emerged as a temporary and partial solution for the aforementioned problems. This project with a budget of 400.900.000,00 KN created employment opportunities for c. 3000 women above 50 years of age and provided social care for around 12000 old and helpless people, located mostly in rural and remote areas of Croatia. This review aims to present the contribution of the project to women empowerment and social/health care of old people in Croatia. **Methods.** The review was performed using the data obtained from governmental reports on this project, Croatian Bureau of Statistics, Croatian Employment Service, as well as from the European Social Funds website. **Results.** Number of registered unemployed women aged 50 or more decreased by 29% in the period from 2017 to 2019. This percentage also pertains to areas of Croatia that were not part of the project, and although this is not the sole result of this project, „Zaželi – program zapošljavanja žena“ had a considerable, national impact on unemployment decrease (more than 50%) of woman over 50 years of age. For example, in Požega city, there was a decrease from 165 to 115 unemployed women, and in the city of Karlovac, the number was halved (from 349 to 172). All women employed, most having just primary or secondary education, were provided with additional education and different kinds of training: „gerontodomačica“, cooking classes, driver's license, first aid courses, occupational safety and health courses, basic computer skills and IT literacy etc. **Conclusion.** „Zaželi – program zapošljavanja žena“ project had a significant impact on the decline in the unemployment rate of women older than 50 years of age in Croatia. Additional education and training made women more competent and skilled which could also help them in finding future employment. Finally, more than 10000 elderly people in need received social, physical as well as psychological care.

## Integration of The Elderly Day Life with The Children Day Care – Example from Israel

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**Introduction.** In our time, loneliness and boredom are common problems among the elderly age group. Elderly living alone, or in nursing homes, becoming more isolated from the younger society. This by itself, may lead to a reduction in communication cycles, lack of physical or emotional contact, and negative feelings such as uselessness, emptiness, and sadness. As a result, outcomes such as mental damage, cognitive depression and, psychological damage may develop. **Aim.** Present novelty idea which can ameliorate life-quality and, and decrease the risk of elderly depression and/or causative mental regression associated with loneliness and boredom. **Case report.** In Israel, from 2010, dozens of private projects are being operated, to give an ideal situation for two marginal age groups, the pediatric and elderly. This is done by merging nursery homes with kindergartens. Meaning, allocating kindergartens to work inside nursing homes. Moreover, to make it even more practical, the kindergarten schedule includes playtime and care with the elderly, giving each participant the option to be an active part of this new community which is being created. **Discussion.** With the global development of new norms, which productivity and functionality are strong applicators of life, we have created a problem that disrupts the healthy community values. The idea of uniting the two extremity age groups is logical and yet, not that common. Inter-connecting between the elderly and children creates a new environment, where each participant benefit. To clarify, children are more likely to develop empathy, maturity, social awareness and at the same time, enjoy genuine attention. Likewise, the elderly are surrounded by an energetic environment and lively attention, with an increasing feeling of value, importance and, functionality. **Conclusion.** Elderly loneliness is a common problem which, should be approached and treated. A solution like presented above is one of many, which is for the benefit of the elderly and, our society's mentality and values.

## The Effect of Different Exercises on Osteoporotic Bone

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**Introduction.** Osteoporosis represents a major health problem worldwide with a rise in the number of osteoporotic fractures, especially vertebral. Diagnose is made by dual energy X-ray absorptiometry showing T-scores of less than -2.5. Prevention is the strategy to avoid future potential fractures in women with osteoporosis, who have already sustained a fracture. As non-pharmacological intervention, physical activity has been proven to play a major role in the increasing of lumbar spine bone mineral density (BMD). The aim of this study, was to determine which exercises can improve bone health in adult women. **Description.** Mechanical load exercises produce mechanical bone stress and activation of osteoblasts. Not all exercise modalities are equally osteogenic. There are certain training programs, that are classified as appropriate exercises for adult women, diagnosed with osteoporosis. Evidence shows that weight-bearing and muscle-strengthening exercises can improve; agility, muscle strength, bone strength, posture and balance. Consequently, reducing the risk of falls and fractures. **Conclusion.** At any stage of osteoporosis, exercise is equally important. Prolonged aerobic training showed significantly low impact on bones, lesser osteogenic response and no influence on walking speed. High-impact weight-bearing exercises (jogging, dancing, jumping), static weight-bearing exercises (single-leg standing) and high-impact non-weight-bearing exercises (progressive resistance exercise with free weights, medicine balls and elastic bands) showed improvement in muscle strength, balance and reduced fear of falling. Combination or single use of resistance training and weight-bearing exercises, prevents major bone loss after menopause. Brisk walking exercises in elderly women found improvements in postural stability. Adding a weight vest improved balance more than walking without a vest. Several case reports describe the benefit of yoga practice, which may improve bone density, but if performed incorrectly, can increase the risk of vertebral fracture. Patients who combined exercise with antiresorptive therapy or hormone replacement therapy, displayed significantly greater increases in the lumbar spine BMD.

## Can Elderly Sleep Without Any Medication?

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**Aim.** Aim of this paper is to see how many people above the age of 65 years take sleep medications in Slovenia. **Method.** We observed two general practitioner offices in Slovenia. The number of patients above 65 years of age was taken. They were divided in two categories: from 65 to 74 years and above 74 years. We observed how many patients in each group are taking sleep medications, what were reasons for prescribing, which drugs they take, and if use increase with age. **Results.** First general practitioner office: They have 199 patients in the age group 65–74 years and in the group all above 74 years there are 158 people. Total number of patients at this office is 1899, which means there is 19% of people above 65 years. Out of the people mentioned and divided in age groups, number of patients that are taking medications for sleep are, in the group 65–74 years 83 (41,71%) people and in the group all above 74 years there are 116 (73,42%) people. Most patients report problems and ask for the medication themselves. The diagnosis set in this case is insomnia. Medications most commonly prescribed are Quetiapine ranging from 12.5 mg to 25 mg, Trazodone and Mirtazepine. Less commonly they might be prescribed Diazepam (apaurin), Bronazepam (lexaurin) and Alprazolam (helix). In second general practitioner office they have 375 patients in a group 65–74 years and in group above 74 years there are 222 patients. Total number of patients at this office is 1853, so there is 32% of people above 65 years. From group 65–74 years 41 (10,93%) of people are taking sleeping medications. In group above 74 years 36 (16,22%) are taking sleeping medications. As in practice above, most patients ask for the medication themselves and diagnosis is insomnia. Majority of patients are taking Sanval (zolpidem) 10 mg or 5 mg. **Conclusion.** In conclusion, we can observe that a lot of elderly people require some kind of sleep medication to be able to have a normal night sleep. We can also see that the use of medication increases with age. It is always the patients who ask for the medication, because they are experiencing insomnia which is interfering with their normal functioning. It is hard to say that the use itself could be decreased, but what doctors do is to try to avoid benzodiazepines, because of their risk of addiction.

## Active Ageing in Croatia from the Public Health Perspective

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**Introduction and Objectives.** Active ageing is defined as a process of optimizing opportunities for health, participation and security in order to enhance quality of life as people age. WHO categorized determinants of active ageing as economic, social, personal, behavioral, physical environment and health and social services. Our objective was to find out how health and social determinants are targeted through public health actions and interventions in Croatia. **Methods.** Data gathering was performed using keywords Healthy ageing, Public health interventions elderly, Public health actions elderly. Search included official Croatian sources: governmental and county websites, Croatian Institute of Public Health and Croatian Bureau of Statistics, in period of last 5 years. **Results.** The proportion of people ageing 65 and over is growing. In 2011 average age of the population in Croatia was 41.7 years and the share of population aged 65 and over was 17.7%. The framework of healthy aging is defined by Croatian Law on health care and National strategy of health development. Public health interventions and actions for elderly in the field of health care and social services include numerous prevention programs provided by many local movements and organizations. Their active participation in the community aimed to health and social needs of elderly include in home support, digitized health care – social alarm projects, education for volunteers involved in elderly health and social care, active socialization activities; all founded by government and EU projects. Elderly targeted health action and interventions are not as numerous as the social ones, yet. The isolation of low socioeconomic households and individuals in rural areas with inability to access health and social services remain challenging. **Conclusions.** Although Croatia is following European trends in care for older people due to financial circumstance and governing bodies there is an inability to provide institutionalization and comprehensive model of care on the state level. Digitization in health care has enabled greater independence of elderly 'everyday life.

Changes in population's age should be followed by policy changes to ensure active and healthy ageing. This would enable increase of active and independent years for the elderly resulting in individual, as well as social and economic benefits for the society.

## How to Optimize the Salt Reduction Interventions Targeting Elderly Population?

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**Introduction and Objectives.** Increased dietary sodium intake is a growing public health problem in developed countries and a risk factor contributing to a wide variety of non-communicable chronic diseases (NCD). Preventable NCDs contribute to higher morbidity, mortality, reduced quality of life of the elderly population and increased healthcare expenditure. Average daily salt intake in Croatia amounts to 11.6 g/day (World Health Organization recommendation is less than 5 g/day), and 19,41% of population is over the age of 65. The specific aim is to detect key valid sources of information, possible opportunities and risks, define main criteria and framework necessary to optimize future interventions and develop large-scale national programs. **Methods.** We used PUB HUB policy coil as a tool which encompasses all necessary steps for policy analysis and covers all policy development steps necessary for comprehensive policy overview. As a starting position for this policy analysis we used World Health Organization recommendations, and international studies focused on the salt intake in the elderly population. Information for mapping of the needs and setting assessment were: national strategic documents, existing interventions, available project evaluations and published papers. **Results.** National Strategic plan for salt intake reduction after 2020 is not yet developed. A specific national program for salt intake reduction in elderly population does not exist. Few interventions for the general population have been developed, but still without noted relevant progress. Interventions in other countries exist, mostly small-scale interventions or randomized controlled trials targeting communities of elderly, e.g. in nursing homes. Some US states legally require inclusion of salt restriction in nutrition programs for the elderly in institutional settings. **Conclusion.** Preserving or improving health in countries with rapidly aging population poses a significant public health challenge and requires long-term planning. Elderly population is comprised of several subgroups, each of them requiring separate interventions – salt reduction is not an "one size fits all" solution. More studies are needed to properly assess the optimal approach, but this policy analysis provides recommendations on how to perform specific mapping of stakeholders, setting assessment and vulnerable groups which may be useful in future planning of large-scale interventions.

## In-house Care for the Elderly in Town of Slavonski Brod Through the Projects of European Union

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**Introduction and objectives.** According to the latest census, conducted in 2011, there are 4 284 899 people living in Croatia. 17% are older than 65 years. 24% of people older than 65 years are leaving in single-person households. Slavonski Brod is 7th biggest town in Croatia. Slavonski Brod is 179th according to development. 59 141 people are living in Slavonski Brod. 10 089 residents of Slavonski Brod are older than 65 years of age. Reduced mobility, health problems and social isolation are affecting the life of elderly people. In-home help providers are trying to ameliorate the suffering and improve the quality of life of elderly people. We provide a detailed survey of in-home help organization in the town of Slavonski Brod. **Methods.** Data were collected in the public institutions. Shortened interview was conducted with all the personnel engaged in organization of the in-home care. Project documentation was obtained and analysed. **Results.** In Slavonski Brod public institutions providing in-home help to elderly people are Towns Society of the Red Cross, Town of Slavonski Brod. In-home help providers are tasked with organization of nutrition, doing housework, maintaining hygiene, providing care for the health and other technical chores. Towns society of the Red Cross, through the program "In home help", in 2019, took care of 193 elderly persons with health problems and low income. 9 in-home help providers provided 53963 services to the persons in need. Project of the Red Cross, "Wish-accomplish" employed 55 women from marginalizes sections of the society as in-home help workers. In 2019 they undertook 93 766 hours of services. They distributed 660 packages of hygiene supplies. Town of Slavonski Brod organised the project "Employed". 62 women were employed. Women were over 50 years of age, some of them were disabled or victims of domestic violence. They cared for 285 elderly people in the wider urban area of Slavonski Brod. **Conclusion.** Croatia is dealing with a problem of increasing age of its citizens. Elderly people make up 17% of population. Poverty, disability and social isolation are difficulties facing a large part of the elderly. In-home help providers provide care and support to the elderly people. Through the projects of the Ministry of Demography, Family, Youth and Social Policy, Social welfare centers and the European Union, in the area of Slavonski Brod, 126 women were em-

ployed and care was given to 754 people in need. 193 persons receive assistance based on impaired health and low income. 561 persons receive assistance through European Union Projects.

## Are Elderly Family Members a Burden on Your Family?

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**Introduction and Objectives.** Even though elderly people are a valued part of society, they are usually not part of the working population; hence they may require financial, physical and medical support. That support often stems from the immediate family, pension funds, personal savings and health insurance. The aim of this study is to assess the financial and emotional implications of caring for an elderly family member on the rest of the family and whether or not it is a burden. **Methods.** For this study we constructed an online survey with 20 questions regarding the presence of and solutions for the potential burden that comes with supporting an elderly family member. The country of residence of the elderly person was required to complete the survey. The questions were related to the following: living with or financially supporting an elderly person, assessment of mental faculty and mental and physical disability, emotional impact on the caretaker, health care access and coverage of the elderly person and opinion on who should carry the burden of the ageing population. We reached the participants through social media platforms and used the snowball effect to reach more working people (parents, superiors, professors and friends). **Results.** Two thirds of participants do not consider taking care of their elderly family member to be a burden. One fifth are financially supporting an elderly person. Half consider financially supporting an elderly person to be some kind of a burden. Also half find the elderly persons' physical disability burdensome. One quarter of participants consider an elderly persons' memory impairment to be a burden. Two thirds experienced some emotional stress to varying degrees due to caring for an elderly person. Most elderly persons have basic health insurance, which in more than half of the cases does not cover home visits and nursing care. Two thirds attribute the majority of costs to the daily expenses, followed by medications and health care of the elderly person. Half the participants believe that society should spend money on the elderly, while the other half believe the money should be spent on children. Half believe that the government should carry the bur-

den of the ageing population. **Conclusions.** Opinions on whether caring for an elderly family member is burdensome are divided and differ between countries. However, many participants agreed that the government should take responsibility for their elderly. There are participants that consider the financial aspect of caring for an elderly person significant. Even more find it stressful caring for their elderly.

## Vertigo in the Elderly

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Vertigo in the older population is a very common symptom and a frequent reason to consult a general practitioner. Its clinical presentation is not very specific and its diagnosis and treatment are quite challenging. Dizziness in this situation is quite benign but it can have serious physical, functional and psychological consequences. One of the common consequences of vertigo is the risk of falls and fractures which has been recognized as a frequent and significant problem in the elderly which comprises multifactorial causes. The most common causes are vertigo, poor vision, poor muscle strength and coordination, medications that cause sedation and low blood pressure, poor sensation and impaired proprioception. One of the most common causes of vertigo is Benign Paroxysmal Positional Vertigo, but also neurologic problems, vestibular areflexia, vascular disorder and Meniere disease should be considered. Complete vestibular examination should be performed to be able to confirm the diagnosis and treat the patient. Importantly, standard caloric tests, using video systems, may show slower responsiveness, possibly due to aging issues which is important to take into consideration and individually adapt all examinations. In conclusion, a careful medical history, adequate diagnostic tools and appropriate, early and usually multidisciplinary treatment are necessary to prevent falls and fractures which can seriously affect the quality of life in the elderly.

## Elderly and Students Housing

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**Abstract.** In the world of today, personal development and social efficiency are on the top priorities, and the world became nonfriendly towards the weak classes of society which usually left alone. Who is included in these groups? The great majorities are elderly, but not only, handicap, patients with disabilities and chronic diseases can be also included. It might be because they are a burden on society and they cannot contribute to the fast-developing world of today? This concerning trend became more common in developed countries leading to a silent crisis of abandoning our elderly, so what can we do about it? **Introduction.** While the negative demographics of Croatia is pounding and ratios between seniors to youngsters are increasing, the elder generation is left alone. The elderly are suffering from loneliness, sadness, and sorrow which have several consequences on the society, health care systems and economy. Elderly who suffers from loneliness is more prone to mental and somatic illness. The phrase “I am alone, nobody needs me anymore so I prefer to die” should not be standardized in our society and it is worth getting our full attention. We should run a policy that incorporates the young generations with the old once. Usually, those gaps are created as a result of biases. We can bridge upon those biases with a rewording system which can contribute to both sides. **Aim.** Our aim is to decrease the time the elderly spend alone by incorporating students in their lives and simultaneously helping students with their expenses. **Case report.** Similar to a project in Israel, in which students will live in the homes of senior citizens. Students who participate in the project will receive free living as well as a scholarship at the end of the year. In addition, this is a worthwhile project that connects the younger generation to the older generations. The project addresses the most burning needs of both populations. From one side the phenomenon of loneliness is common among veteran citizens living on their own, and on the other, the high housing prices with which students, mostly living on rent, have to deal. Besides, financial assistance the students will get credit points for their future residencies. **Discussion.** Our society is changing rapidly, values such as respect for the elderly is disappearing. Because of it, a large cut of the population is paying the price and neglected on a daily bases. Incentives such as scholarships, credit points and discounts in rent, might be a great solution for both sides. It is likely that at first, it will hard to convince both sides to cooperate, but with proper rewarding.

## Cognitive Impairment and P300 Changes in Patients with Multiple Sclerosis

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**Introduction.** Cognitive dysfunction is one of seldom analyzed features of demyelinating diseases, particularly multiple sclerosis. It can be shown by psychological testing and by electrophysiological analysis of event-related potentials. The most reliable electrophysiological parameters for the level of cognitive dysfunction seem to be the latencies and amplitudes of P300 waves. **Materials & Methods.** Study included a group 50 patients (37female, 13male, mean age 37.5 years) with MS and the age and sex matched control group. Both groups were subjected to the auditory event-related potentials testing (auditory stimulation, oddball paradigm, 15% target (high-pitched) and 85% non-target (low-pitched) stimuli, total of 1024 stimuli in one run). Psychological testing was done using the California questionnaire. Quantitative variables were compared using Mann-Whitney Test. The Fisher Exact Test was used for comparing the qualitative data. Spearman's Rank correlation coefficient. **Aim of Study.** The aim was to determine the incidence of cognitive impairment among the patients suffering from multiple sclerosis and to correlate the electrophysiological findings both with the level of cognitive dysfunction and with the major features of the underlying disease (age and sex of the patients, present state of the disease activity, duration of the disease, location of demyelinating lesions, leading symptoms, and concomitant diseases). **Results.** The results showed that the latencies of late cortical P300 waves are prolonged in the group suffering from MS, particularly for target stimuli (frontal and parietal components). The variability of amplitudes was too great to allow any statistically significant difference between the groups. Correlation between electrophysiological and psychological findings was high and statistically significant, and significant positive correlation between level of cognitive dysfunction and the major features of underlying disease. **Conclusion.** Electrophysiological studies measuring late cortical P300 wave latencies can be used to indicate the level of cognitive impairment in patients with MS.

## The Attitude and Knowledge of Medical Students Regarding Dementia

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Due to aging of population and increasing number of older people with dementia, in the near future majority of doctors are likely to spend more time caring for people with dementia. Therefore, there is a pressing need worldwide to improve undergraduate medical education on dementia in order to improve skills of healthcare professionals for competent care for people with dementia in hospital and community settings. Additionally, healthcare professionals' attitudes to dementia may also contribute to unsatisfactory care of people with dementia and should be modified. The main objective of our research was to determine attitudes towards and knowledge of dementia in a sample of final year students at the School of Medicine, University of Zagreb. Students who were willing to participate were included in the study and filled an anonymous questionnaire. The paper-and-pencil questionnaire included questions on sociodemographic data (category I); overall and specific success during the study of medicine (category II.); personal interests (category III.); personal attitudes towards dementia and experiences with dementia patients (category IV); knowledge of dementia (category V); personal opinion on the representation of dementia in undergraduate curriculum (category VI) and Croatian version of "The Alzheimer's Disease Knowledge Scale" (category VII). The study was approved by the Ethics committee of School of Medicine, University of Zagreb.

At the time of submitting this abstract, 226 students completed the questionnaire (out of approximately 281 students on the final year at the School of Medicine, University of Zagreb). Statistical analysis is currently underway and preliminary results will be presented on the conference.

## Effect of Autophagy Modulators on Cardiac Aging in Mouse Models Studies: A Systematic Review

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**Introduction and Objectives.** Progressive structural and functional impairment of the heart is among the most significant features of aging. As a consequence, the prevalence of cardiac diseases is increasing with a constantly growing elderly population. Novel interventions are needed to address this upcoming problem. Disorders of autophagy, a lysosomal degradation process, have been suggested to have an important role in aging. This review aims to provide information about the effects of recognized autophagy modulators on cardiac aging in mouse model studies, which could be useful for understanding changes in the aged human heart. **Methods.** This study is based on a systematic review of medical literature. Pubmed search was done on February 8, 2020, for all existing publications, using medical subject heading terms („aging“; „autophagy“; „heart“; „mice“) and text words („aging“; „autophagy“; „heart“; „mice“). The abstracts were limited to English-language studies. Publications were selected for inclusion if they studied the effect of autophagy on the aging heart, using genetic or external/pharmacological modulations of autophagy. Publications were excluded if they studied only the effects of inactivation of autophagy-related genes. Our search strategy yielded 21 abstracts, out of which 10 were selected for full-text screening. **Results.** Full-text screening showed the beneficial or potentially beneficial role of autophagy inducers. These were rapamycin, AICAR, spermidine, oleate, and high-intensity exercise stress that targeted autophagy-related molecules, mTOR, Beclin-1, ALDH2, AMPK, FOXO, and NRF2. On the other hand, fasting in old mice, caloric restriction in young mice, and palmitate showed a detrimental effect on autophagy. **Conclusion.** Beneficial effects of autophagy are exerted by reducing aging-induced contractile dysfunction, slowing down the aging process, and improving health. Since these studies suggest that autophagy has an important role in aging, it represents a potentially good target for reducing age-related cardiac dysfunction.

## Medical Literacy and Opinion of Women on Hormone Replacement Therapy in Menopause

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**Introduction.** Menopausal women are encountered to a greater extent with decisions about hormone replacement therapy (HRT) in the context of contradictory views and inconclusive evidence. HRT use is a health-related decision which requires detailed information, consideration of various potential risks, benefits and a woman's choice. The main reasons behind not intending to take HRT are general preference not to take medication and a belief that treatment of menopause, which is not considered an illness unless severe symptoms were present, is unnatural and unnecessary. Besides, potential side effects, fear about cancer and long-term safety concerns of HRT were one of the motives frequently mentioned in the literature so far. **Objective.** We aimed to evaluate whether middle-age women are prone to take HRT, their attitudes and perceptions towards using HRT, as well as specific concerns and information sources on HRT. **Methods.** The study was carried out during three days in February 2020 and has taken place in three family physician offices and one gynecology office in Zagreb. The anonymous survey included 9 questions and tested perspective and knowledge of participants about the benefits and risks of HRT. The participants were women  $\geq 45$  years of age. **Results.** A total of 36 questionnaire forms were filled and used for statistical analysis. The majority of women were informed (67%) about HRT. The leading source of information about HRT was their gynecologist (31%). The main reasons for participants to avoid HRT (89%) were not feeling the need to use it and the belief that menopause is a natural process that does not need to be treated. Conversely, the supporters of HRT use (11%) cited the trust in their physician's recommendation as the main argument of approval. **Conclusion:** Undoubtedly, due to prejudice and insufficient education on this topic, women are unfavorably influencing their quality of life. Since nowadays the limit age of retirement and life expectancy are prolonged, the goal is to make one's well-being optimal. As health care providers, it is important to discuss with women both the benefits and risks of HRT and make the decision depending on the debilitating symptoms they are experiencing, their medical history, family anamnesis, and supremely willingness.

## Sleep Deprivation and Its Role in The Early Pathology of Alzheimer's Disease

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**Introduction and Objectives.** Alzheimer's disease (AD) is the most common form of dementia and it represents one of the biggest health challenges of today's society. Sleep disturbances are one of the hallmarks of the disease, occurring long before the onset of cognitive decline. Assuming that therapeutic interventions are most efficient during the preclinical stage, the aim is to present research showing a correlation between sleep deprivation, beta-amyloid, and tau protein. **Methods.** To discuss the relation of sleep to the glymphatic clearance of the brain macromolecules beta-amyloid and tau, we searched PubMed with keywords sleep deprivation, Alzheimer's disease, beta-amyloid, and tau. The search identified 19 studies in humans and non-human species. Only randomized control trials and review articles were included, which yielded a total of 9 results. **Results.** One randomized controlled study showed that one night of sleep deprivation in healthy subjects significantly increased morning beta-amyloid levels in the CSF, while the other randomized crossover study showed no significant changes in the build-up of Alzheimer's disease biomarkers. All of the review articles presented studies that show a bidirectional relationship between sleep deprivation, in terms of increased wakefulness and decreased NREM sleep, and accumulation of either beta-amyloid and tau protein, or both. **Conclusion.** Since AD pathology occurs 15–20 years before the start of cognitive decline and given that sleep deprivation reduces the activity of the glymphatic system and therefore reduces the clearance of AD biomarkers, considering the important role of sleep as a treatable and a modifiable risk factor of AD might become a target for therapeutic intervention in the preclinical stage of the disease and a preventative strategy. Further meta-analysis should be done to estimate the significance of the studies.

## Attitude of Medical Students Towards Older Persons

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**Introduction and Objectives.** The progressive aging of society, caused by profound demographic changes, goes with necessity of confronting the subject of biases against the elderly. Competencies include not only knowledge and skills but also attitudes and the ability of activating and utilising them in certain situations. Medical students often get a skewed perspective on older persons, being exposed mainly to sickest ones. Education in medical school can be a part of solution to combat prejudice and improve care for older adults. The goal was to find out the attitude of medical school students in their clinical years towards older persons. **Methods.** Scale Test About Meaning of Your Attitude Towards Older Person by Department of Public Health Gerontology, Andrija Štampar Teaching Institute of Public Health, Zagreb, Croatia was used. Test contained 16 questions consisting of opposing descriptions of older persons. Data were processed in a way that each description had 7 possible answers (7 levels ranging from –3 to +3). By summation of such values results were acquired for each question. 3-day online questionnaire for students in clinical years was made where they were able to voluntarily participate. **Result.** 112 medical students who responded to online test were questioned in order to assess their opinions on older persons. On 10 options in the questionnaire the greatest number of participants described older persons with a score 0, indicating that they are equally distant from both extremes and the least number of participants marked older persons with –3, showing that the least number of participants had negative opinion of older persons in these categories. Other categories showed that regarding some traits, older persons were considered positive, with greatest number of respondents considering them useful and experienced and minority of participants regarding them opposite. On the other hand, there were some categories where greatest number of participants had such attitude, that they marked elderly as slower and more dependent on help. In the presentation, results are described in more detail. **Conclusion.** Most of the participants showed either positive or neutral stance towards the older persons. Many medical students still

deem older persons as slower and more help dependent but at the same time think they are useful and experienced. More practical experience with a variety of older persons could help further improving the competences of medical students.

## Timing of Antiviral Therapy with Neuraminidase Inhibitors and Baloxavir for Seasonal Influenza in Older Patients

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**Introduction and objectives.** Seasonal influenza is an acute respiratory illness, caused by influenza viruses, which occurs in outbreaks and epidemics, mainly during winter season. Although it is usually self-limited infection (uncomplicated influenza), older individuals (of age 65 and above) are at high risk of complications, such as pneumonia and acute respiratory distress syndrome, leading to increased morbidity and mortality. Such patients are target population for treatment with antiviral drugs such as neuraminidase inhibitors (oseltamivir, zanamivir, peramivir) and the selective inhibitor of influenza cap-dependent endonuclease-baloxavir. The aim of this study was to provide information about application and timing of these treatment options in older patients with seasonal influenza. **Methods and materials.** This study is based on literature review of treatments for seasonal influenza, performed in January 2020, with a focus on timing of antiviral treatment with neuraminidase inhibitors and baloxavir in older patients. **Results.** Antiviral therapy can shorten duration of influenza symptoms by one half to three days, with greatest benefit being associated with starting the treatment within first 24–30 hours. Also, studies suggest that early antiviral therapy reduces severity and incidence of complications of influenza, length of hospitalisation and influenza associated mortality. Despite prevailing impression that there is little or no benefit when treatment is initiated two days or more after onset of influenza, some benefit may remain for older patients even after initial 48 hours, it was also found that only 13% of patients contact their clinician within 48 hours of symptom onset. In older patients with moderate to severe symptoms, it has been found that antiviral therapy reduces symptom duration by 2.3 to 3.2 days if it is initiated 48 to 72 hours after symptom onset. **Conclusion.** Antiviral therapy for seasonal influenza should be ini-

tiated as promptly as possible since it is most likely to provide benefit when initiated within the first 48 hours. However, therapy should not be withheld in older adults even after 48 hours of symptom onset because of proven efficacy in such patients. Nevertheless, since antiviral therapy shows greatest benefit when started earlier efforts should be directed at detecting influenza earlier in order to obtain greatest possible therapeutic benefit.

## A Review of Different Solutions for Automatic Fall Detection and Alerting

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Accidental falls are one of the primary causes of injury among the elderly population. Prompt arrival of help is crucial for minimizing the health risks and consequences posed by such falls. Automating the fall detection process and timely alerting can greatly increase the independence and quality of life of elderly people. This has proven to be a challenging problem due to the high variety of fall events and other similar activities that a fall detection system needs to correctly classify. User comfort and privacy also need to be considered while designing such a system. Numerous solutions to this problem have been proposed and tested with high levels of success. Most of these solutions are based on measuring the acceleration of a particular part of the body of the subject using an inertial measurement unit (IMU). However, in order to increase the reliability of the detection and alerting system, multiparameter acquisition from various sensors may be used. In this paper we compare some of these solutions, including those explored at the Faculty of Electrical Engineering and Computing, University of Zagreb, and discusses potential future avenues of advancement in this field.

## The Risk for OSA Increases with Advanced Age – a Large Population Study in Western Herzegovina

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Numerous epidemiological studies confirmed that the prevalence of obstructive sleep apnea (OSA) is varying among different age groups of the general population, with an increase in prevalence among older age groups. Since diagnostic procedures used for OSA evaluation are expensive and time consuming, appropriate assessment of the increased risk for OSA with reliable screening tools is crucial. However, the effects of age on the risk for OSA and excessive daytime sleepiness, as one of its leading symptoms, remain controversial. Thus, given the clinical and psychosocial importance of OSA and excessive daytime sleepiness, the aim of this study was to assess the risk for OSA and daytime sleepiness in a large population sample, with regard to age. A large population sample included 10108 respondents, 4748 (47.05%) men and 5344 (52.95%) women from Western Herzegovina, with the median age of 30 (IQR 20–51). The participants completed STOP questionnaire and Epworth sleepiness scale (ESS), validated screening tools for assessment of OSA risk and daytime sleepiness, respectively. An increased risk for OSA was considered as two or more positive answers to STOP questionnaire (snoring, tiredness, observed apneas and increased arterial blood pressure), while a high score on ESS (range 0–24) indicated excessive daytime sleepiness (ESS>9). Following allocation of the respondents to age groups, Chi-square test and Pearson's correlation analyses were performed. A total of 2796 (27.66%) respondents had an increased risk for OSA, while 7312 (72.34%) were not at risk for OSA. The risk for OSA increased with age ( $\chi^2=1947.67$ ,  $P<0.001$ ). Furthermore, male respondents had a higher risk for OSA compared to female respondents in young and middle ages (<21 years, 21–70 years) ( $\chi^2=11.94$ ,  $P=0.018$ ). However, there was no statistically significant difference in the risk for OSA between male and female respondents in advanced age (>70 years) ( $\chi^2=5.678$ ,  $P=0.018$ ). Participants who had increased risk for OSA had more pronounced daytime sleepiness compared to participants who were not at risk (ESS score  $7.99 \pm 4.16$  vs.  $6.75 \pm 3.83$ ,  $P<0.001$ ). However, a negative correlation was found between age of the study respondents and daytime sleepiness evaluated with ESS ( $r=-0.082$ ,  $P<0.001$  for subjects with increased OSA risk, and  $r=-0.122$ ,  $P<0.001$  for those with

no risk for OSA). The results of this study conducted on a large population sample demonstrated that the risk for OSA increases with advanced age. However, even though daytime sleepiness is one of the major OSA symptoms, it is less pronounced among subjects of older age groups, emphasizing the influence of age on OSA symptomatology.

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**BETTER FUTURE of HEALTHY AGEING 2020**

## **Policy Paper**





## Policy Paper on Healthy Ageing – BFHA2020 Conference

### Introduction

Populations around the world are ageing faster than ever in the past. A constant and already impressive rate in the worldwide increase of life expectancy has led to the fact that the current proportion of the population above 60 years (17%) will double in the next thirty to forty years. In the next 30 years, every third person in the world will fall into the category of a senior citizen. This demographic transition will have an impact on almost all aspects of society and requires a complete and well-defined shift in the paradigm in the medical, social, and technological fields.

Croatia's Presidency of the Council of the European Union 2020 highlighted demographic challenges and ageing as important issues. Under the Horizon 2020 Work Programme Health, demographic change and wellbeing 2018–2020 call 10 within the section "Other actions", a conference **Better Future of Healthy Ageing 2020 (BFHA 2020)** took place as a part of "Croatian Presidency event – Innovation for better ageing", organized by the University of Zagreb School of Medicine at the Andrija Štampar School of Public Health.

The conference addressed growing demand caused by global trends of population ageing and the expansion of chronic disease by focusing on potentials large-scale implementation of innovations to foster functional ability and wellbeing of older people. The objectives of the conference were:

1. to address issues of ageing of biological systems through the topics of regenerative medicine, neuroscience, clinical medicine, and other fields of medicine with the emphasis on personalized and integrated medicine;
2. to showcase the impact of smart technologies for age friendly ecosystems by providing a discussion on scaling up innovations and solutions for age-friendly environments;
3. to analyse the issues of ageing and healthcare system sustainability at various levels (e.g. institutional, regional, state, EU level).

Based on the three objectives the conference **Better Future of Healthy Ageing 2020 (BFHA 2020)** was divided into three main themes:

- **Ageing of Biological Systems**
- **Smart Technologies for Age Friendly Ecosystems**
- **Ageing and Health System Sustainability**

This paper is a result of the conference discussions. This paper aims to present the current state of the art in the three themes discussed during the conference and to raise questions important for future discussion within the EU concerning healthy ageing. It will also set out specific goals within each of the three teams and mechanisms for possible actions their monitoring to promote accountability in future discussions within the EU.

### Ageing of Biological Systems

Ageing, although highly individual and not easily comparable among subjects and societies, is a major risk factor for age-related conditions and is causal to many age-related diseases including COPD, cardiovascular disease, neoplasms, osteoporosis, rheumatoid arthritis, cataract and Alzheimer's disease.

There is good evidence, shown in animal models and recent clinical studies in humans, that ageing is a risk factor and decelerating ageing has the potential to decrease risks of developing the disease. These approaches include maintaining body composition (reducing obesity), good nutrition (less meat, more fruits and vegetables, e.g. Mediterranean diet), more exercise, healthy sleep habits, moderate alcohol consumption (glass of red wine taken with a meal), intake of probiotics.

From the biological point of view, it is challenging to link age-related diseases to general principles of ageing, which means that discovering approaches to decrease the rate of protein damage could have beneficial effects on all age-related diseases including COPD, cardiovascular disease, neoplasms, osteoporosis, rheumatoid arthritis, cataract and Alzheimer's disease.

Ageing can be accelerated or decelerated by interfering at the cellular level with several mechanisms driving ageing including the accumulation of excessive DNA damage or misfolded protein or cells which have aged and are no longer functional but release inflammatory factors which are detrimental to the organisms (senescent cells). By decelerating ageing, it is possible to reduce the risks of developing age-related diseases and improve health span.

European Brain Council estimates that in Europe the total cost of brain diseases on a yearly basis amounts to around 798 billion euro; for dementia only, the cost is 22.000 euro per patient, per year. Considering the costs of dementia for the European society and

that these costs will increase considerably in the coming years due to the ageing of the European population, one way of curbing this increase and eventually decreasing the costs is via intensified research. Only by improving the insight into the basic functioning of the brain and translating this knowledge to the disease state, understanding the causes of the disease process and paving the way for better targeted and improved treatment can the upwards spiral of the costs of brain disorders can be stopped.

Particularly there is the need to emphasize the importance of raising awareness and encouraging education on the brain and the repercussions of neurological and mental health conditions on society as a whole considering that the vast majority of brain disorders are strongly influenced by an ageing population, where an increase in healthy ageing is desired.

Ischemic heart disease (IHD) is a major cause of morbidity and mortality among older persons, as the age represents the strongest risk factor for the development of the atherosclerotic changes along the arterial tree. Older patients often have an atypical clinical presentation and more complications. Stated facts leave for the task on future trials to involve more elderly in their investigations, therefore pathophysiology, presentation and treatment can be better understood.

Rheumatic diseases are a prevalent group of entities with a significant impact on the quality of life and morbidity in older persons. Adequate timing of contemporary treatment that is available can lead to prevention of disability; decline in sick leave, prolongation of time actively spent at work, as well as increased survival.

Neoplastic diseases are, having some exceptions in the field of hemato- and neuropathology, by far more common in older people. The theoretical basis of this is wide, not always well defined by clearly including the passing of time as one of the key factors. Sophisticated technologies are today opening widely the field of multigene testing, meanwhile also opening the question of rationalizing diagnostic efforts.

Sleep is the state at which we spend around one-third of our life. It is not the only duration of sleep that is linked to increased morbidity and mortality like in chronic sleep deprivation and insomnia but also sleep quality which is reduced in many sleep disorders. Certain sleep disorders are strongly associated with age and so prevalent in older populations being present in 50% or more people. They are also strongly associated with the most prevalent diseases of today such as dementia, cardiovascular diseases, and hypertension, as well as diabetes. Intermittent hypoxia during sleep in Obstructive Sleep Apnea (OSA) patients is a major concern in sleep medicine of today and it is highly prevalent but treatable sleep breathing disorder whose

treatment is one of the strongest possible prevention measures which may help in securing healthy ageing by preventing some of the major causes of death in this age, such as stroke, myocardial infarction, arrhythmias, diabetes, etc.

Ageing is a risk factor for frailty, a common clinical syndrome in older adults, defined as an accumulation of deficits and loss of resilience to adverse events and increased risk for poor health outcomes including incident disability, higher hospitalization, and mortality rate. There is evidence that by targeting mechanisms such as senescence it prevents or reduces frailty and improves the ability to overcome adverse events such as fractures and infections.

Policies that will support the testing in clinical trials with a new class of drugs and integrate their use with existing public health interventions are required. There are many issues with establishing clinical testing for drugs targeting ageing in older patients with multiple chronic conditions. This group of people is often excluded or under-represented in drug testing trials. Due to the lack of knowledge and a clear route to market pharmaceutical companies do not invest in the testing of these drugs and therefore governmental funding is required to risk their investments and open a new market which will bring both better health and great economic benefit and competitiveness in Europe.

The time and cost of current clinical trials in humans delay the delivery of innovative medicines to those in need. The EU, working with national governments, has an opportunity to reduce the time and cost of European and global trials by encouraging Europe-wide mechanisms for ethical reviews of drug protocols, by innovating digital means of recruiting and testing trial participants and by linking European trial support mechanisms with those in other regions of the world (e.g., the European Prevention of Alzheimer's Dementia partnership with the North American Global Alzheimer's Platform).

It is important not only to focus on an already aged population but also on those who will inevitably enter this stage. Ageing is a continuous process starting in utero, and interventions should be focused across the life course. There is a clear need for the medicine of the 21st century to focus not only on persons with existing problems but also to shift its focus to presently healthy individuals who are soon entering the senior category. Similarly to focus on preventing certain diseases by applying standards of health promotion such as a healthy diet and exercise, we need to become aware of the need for programmes that will move us into pursuing the goal of healthy ageing in all its elements. These should include prevention of injuries, an individual approach to cognitive and mental health, prevention of chronic diseases, and general social engagement.

It is possible to decelerate ageing with public health interventions such as exercise and a healthy diet but also with the development of new drugs which have the potential to prevent multiple age-related conditions and improve the resilience of the older population. COVID-19 pandemic is an excellent example of how interventions improving resilience may protect older people from death.

Furthermore, there is a constant need for strengthening the information flow and accelerating the exchange of experience on the on-going and future projects as well as maintaining continuous dialogue between all the stakeholder groups at the national and European level and initiatives to allow that objectives are aligned, and needs are met.

### Smart Technologies for Age Friendly Ecosystems

Modern Information and Communication Technologies (ICTs) can play a key part in helping older people to lead more independent and healthy lives and to improve social participation. Age-friendly technologies and ecosystems allow older people to live independently, monitor their health, create and maintain social networks, stay in contact with friends and family, have access to goods and services, and engage in work or voluntary activities. Smart ICT solutions and advanced artificial intelligence (AI) implemented in homes, communities, and cities can be used to provide personalized healthcare and social services, solutions to overcome lack of mobility, cognitive and visual problems. They also can improve the general quality of life by providing interactions with family, friends as well as health care and social care providers through telehealth. Digital technologies can encourage all groups of patients, and older persons, to take a more active role in their health management.

Regarding the scientific approach to ageing research, we must improve measurement, monitoring, and understanding of that field. Focused research, new metrics, and analytical methods are needed for a wide range of ageing issues. This work builds on the extensive work WHO has done in improving health statistics and information, for example through the WHO Study on global ageing and adult health (SAGE). The examples of proven and good practices of using advanced technologies to increase the functionality and well-being of ageing citizens will contribute to a deeper understanding of how to adopt and implement these proven good practices in various European and International contexts.

Smart technologies and the data collection related to the use of these tools could be a powerful research engine for age-related conditions and to advance healthy ageing. Consider Alzheimer's disease as an example.

Increasingly, the research community is developing evidence that indicates that cognitive and motor changes may occur before symptoms. Smart technology and digital tools may be best suited to detect cognitive decline in the earliest stages of the disease. To advance the opportunity, there should be broad collaboration in the identification of readily accessible digital biomarkers to advance digital phenotyping with a plan to develop, test and implement new technologies. One possible centre for collaboration could be with the Davos Alzheimer's Collaborative, being led by The Global CEO Initiative on Alzheimer's Disease and The World Economic Forum. The development of digital phenotyping for Alzheimer's would also support other areas of research focusing on ageing.

Addressing the issues of tracing and assessing the use and impact of advanced technologies for the functionality and well-being of ageing citizens to the benefit of transformative and mission-oriented research and innovation agenda, is going beyond the traditional focus on the scientific impact of research. On the contrary, it emphasizes societal impacts, structuring impacts on policymaking and policies as well as impacts on innovation and economy.

### Ageing and Health System Sustainability

Equally complex as biological ageing is defining and promoting actions towards filling societal needs caused by ageing processes. Apart from the need to bridge biomedicine and social sciences, it is important to focus on a macro, mezzo, and micro level scope when investigating ageing phenomena.

By thinking strategically, we must clearly distinguish a) strategies aimed at the individual level to slow down ageing in the biological system and b) strategies aimed at the population level to define and pursue societal initiatives and policy changes to establish clear and effective approaches to address the public health impacts of an ageing society.

Today, we are facing healthcare challenges as the result of the rising and potentially unsustainable health and care costs, due to the increasing prevalence of chronic non-communicable diseases, to an ageing population requiring more diversified care and to increasing societal demands.

Most health services and health systems are well designed to cure acute conditions or symptoms and tend to manage health issues in disconnected and fragmented ways. Lack of coordination across care providers and health services settings as well as not optimal time-management could be especially dangerous for organizing optimal care for older persons. Health systems need to be transformed so that they can ensure affordable access to evidence-based medical interven-

tions and timely organized shared care to address older people with specific needs according to their social determinants of health.

Health care and social care should be connected. The single disease model of care should be replaced by a more holistic approach where older people with multiple conditions are managed by a team of specialists and where the geriatricians are at the centre of delivering care, involved in much earlier stage. It is the only way by which health care can prevent further health deterioration, disability and prevent complicated care dependency later in life.

We recognize an urgent need to define clear goals, both for caretakers and caregivers. What are the expected outcomes? For a person impaired by joint pain, healthy ageing should focus on “active ageing”, while for a socially isolated person, it should include an element of community and social involvement. A retired person who is feeling superfluous should be able to attend a supportive programme to facilitate the transition from work to retirement, and one who is diagnosed with dementia should get adequate and quality support to better manage with this specific condition.

We often ask ourselves the following questions: Are we attempting only to promote longevity without an increase in the quality of life? Or are we also concerned with reducing costs linked to ageing? What are the final goals and measures that will tell us whether the users of our healthy ageing programs are successfully treated? However, there is no healthy longevity without an increase in quality of life on all stages.

Considering this idea, our health systems will need to become more aligned with the needs of an older population with the introduction of special programs to prevent the onset of diseases. The focus of the health service provision needs to shift from treating illness in clinical settings to preventing it by integrating care to include health promotion activities, and by including the often-overlooked mental health services, as well as non-clinical and non-pharmacological interventions, such as community and social services, as well as self-care practices. This would bring us closer to achieving a healthier population with an improved quality of life, which is one of the fundamental goals of a health care system.

We recognize a need for coordination among different caregivers as a prerequisite to offer complete care and this is a natural and logical complement to integrated care. Creating age-friendly environments requires actions to combat ageism and abuse, enable autonomy, and support healthy ageing in all policies and at all levels of government.

An integrated approach to ageing targeted at all the segments of health care is also likely to reduce the need for an expensive, interventionist hospital to be used

most intensively in the senior population and particularly at the end of life care, thereby reducing costs. As health includes more than medicine, the integration of non-pharmacological, self-care interventions with medical services in the care of the senior and pre-senior population would improve the efficiency and sustainability of health care systems that are continuously facing increased costs partly precipitated by extended ageing demands and increased costs of advanced health care technologies.

While limiting cost is one approach to ensuring the sustainability of the health system faced with the challenge of extended ageing, creating innovative funding schemes to address differing needs caused by ageing is also important and a challenging prospect that requires a different perspective. When making policy recommendations, national governments need to consider the implications of these on general health, including healthy ageing, as defined by the WHO framework for country action.

The promotion of healthy ageing will have massive implications not only on health care costs but also on the quality of life for older persons. Every person – in every country in the world – should have the opportunity to live a long and healthy life. Yet, the environments in which we live can favour health or be harmful to it.

The quality of the living environment and spatial epidemiology plays an important role in defining the health risks of the population. Especially in the face of rapid urbanization which is considered an important contributor to the growing burden of mental health across European and world populations. Equitable access to high-quality green spaces, in the light of new research as well as Sustainable Development Goals, becomes an issue of environmental justice and highly policy-relevant approach in the endeavour to mitigate the negative effects of ageing in the urbanized world. Another important factor is accessibility to quality health regardless of social determinants of health and other sources of vulnerability. These issues became more and more apparent when considering the ageing of the population. Healthy ageing is about creating the socio-ecological climate and opportunities that enable people to be and do what they value throughout their lives.

Active and healthy ageing is a societal challenge shared by all European and other countries of the world, but it is also an opportunity. It is important to acknowledge that the EU and European governments can learn from the experience of other countries the evidenced-based changes most effective in transforming their health systems to adjust to the growth of ageing populations. At the same time, governments within the EU can learn from each other as well. To that

end, the EU and individual governments would be well to consider sustainable mechanisms to exchange data and learnings in this regard. It is a chance for Europe to establish itself as a global leader that can provide innovative solutions. Considering the current context, it is essential to take the lessons from the Coronavirus disease (COVID-19) pandemic which has particularly high fatality rates among very old people, notably those living in residential care, and chronic patients. It outlines the importance of disease prevention using hygiene measures, well known long-ago. It also has shown us all the importance of every person's involvement in creating a healthy environment, healthy relationships and the importance of mental health, building solidarity, and social awareness of health needs of those who are in danger, especially senior citizens. The WHO Decade of Healthy Ageing (2020–2030) is offering a unique opportunity to make this narrative a true reality for older persons, their families, and communities.

The scientific multidimensional concept of healthy ageing is defined as the process of developing and maintaining the functional ability that enables well-being in older age. As people age, their health needs tend to become more complex determined by specific health issues and specific health demands of older patients.

*Therefore, the following issues need to be included as research areas in future research funding and planning through different European Commission research funding schemes in order to reduce mortality and morbidity of different age-related diseases:*

1. Translational research into brain diseases will improve insight into the basic functioning of the brain.
2. Research into causal relationships and mechanisms that can reduce and prevent frailty syndrome in the older population.
3. Research into repercussions of neurological and mental health conditions on society as a whole.
4. Research into sleep disorders strongly associated with age.
5. Special emphasis should be put on the research of gender, income, and geographically related differences in the burden of disease in the older population and public health research into health promotion and disease prevention of age-related conditions.
6. Research in novel AI and IT solutions that can help in promoting health, preventing disease and alleviating in the burden of disease in age-related conditions and improve health in the older population.
7. Research on factors and causes that are connected with the issues of polypharmacy and concrete

*ways to prevent mortality and morbidity that is related to it especially in the older population. (DIRECTORATE-GENERAL SANTE is responsible for EU policy on food safety and health and for monitoring the implementation of related laws. Through its scope of action together with the European medicines Agency (EMA) can play an important role in the implementation of successful policies related to polypharmacy.)*

8. Develop EU-wide coordinating mechanisms to increase the speed, efficiency and effectiveness of clinical trials and establish clinical testing for drugs targeting ageing in older patients with multiple chronic conditions (Here the European medicines Agency (EMA) can play an important role by introducing policies that will support the testing in clinical trials with a new class of drugs and integrate their use with existing public health interventions are required.)
9. Project for education and training of both care-takers and caregivers in issues related to specific conditions related to ageing should be introduced and funded through EU funding schemes.
10. Projects that are oriented to reducing vulnerability and improving resilience, reducing social isolation and promoting social inclusion of older populations across EU also those projects that are oriented to healthy urban planning should be introduced and funded through EU funding schemes.
11. Support sustainable mechanisms within the EU and between the EU countries and other countries to exchange data and learnings regarding the most effective evidence-based practices and innovations needed to transform national health systems in a manner best suited to prevent, treat and care for the chronic and social conditions affecting the health and well-being of older populations.
12. Finally, within the European Commission the following issues should be addressed and discussed:
  - a) Is there a need to agree on the EU level for creation for Pan European Policies that will define the minimum standard of social care and health care to all European citizens' especially older population? This will entail the creation of a special fund that can help reduce inequality across different age groups and different EU member states.
  - b) In the light of COVID-19 pandemic which has particularly high fatality rates among very old people, notably those living in residential care and chronic patients to come to an agreement on the EU level for creation for Pan European Policies that can in the future

*help in better coordination of rapid response among EU members states that will be based on the principle of solidarity and subsidiarity in emergencies taking into account specific needs of each EU member state?*

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