IEEE European Public Policy

ICT for the Prevention of Noncommunicable Diseases and Health Promotion in Europe

An IEEE European Public Policy Position Statement

Adopted 16 January 2018

Recommendations

- Noncommunicable disease (NCD) prevention and health promotion can increase life expectancy and the quality of life, and decrease healthcare expenditure and indirect costs to the society and European economy. Information and communications technology (ICT) should be utilized to enhance NCD prevention and health promotion at many levels and in numerous ways.
- Childhood obesity and mental disorders are crucial and potentially highly effective targets for ICT applications. Tailored functionality for their prevention and control, along with the NCD prevention functionality for the other groups, should be built in the related ICT systems.
- NCD prevention and health promotion functions should be built into public health ICT systems. This also includes functions for planning preventive actions and for the surveillance of the effects of the preventive work. NCD prevention and health promotion functions should also be built into the eHealth infrastructure the European Commission is currently working on.
- ICT should be utilized to provide linkage between data on labor, employment, consumption, education, social welfare, possible other relevant data, and the electronic health records. Broad ICT-based data linkage has the potential to amplify NCD prevention and control to an unforeseen level. Data linkage requires that the privacy and protection of all individual data can be guaranteed.
- ICT-based risk assessment systems should guide the identified high-risk individuals to the appropriate evidence-based self-care chains, or to professional care chains or interventions, as appropriate.
- Preventive ICT solutions should be designed as parts of care chains. Preventive ICT best practices could be included in the NCD prevention and management guidelines, as well as in the care chains associated with NCD prevention.
- Qualified healthcare actors should actively produce evidence-based ICT solutions for NCD prevention and health promotion to overcome the corresponding non-evidence-based products on the market. The evidence-based ICT solutions should also be effectively advertised.
- Large-scale healthcare ICT infrastructures should support future genetics-based NCD prevention.
- Healthcare professionals should be able to utilize self-assessment data from personal apps and gadgets in the preliminary assessment of the need for proper risk assessment or medical testing. For this, a certification procedure should be devised that was lucrative to the small and medium-sized enterprises and made the data trustworthy for the healthcare professionals.
- Implementing “eHealth Action Plan 2012-2020 - Innovative Healthcare for the 21st Century”[1] by the European Commission is strongly recommended.

Introduction

"A relatively small group of health conditions is responsible for a large part of the disease burden in Europe. Of the six WHO regions, the European Region is the most affected by noncommunicable diseases (NCDs), and their growth is startling. The impact of the major NCDs (diabetes, cardiovascular diseases, cancer, chronic respiratory diseases and mental disorders) is equally alarming: taken together, these five conditions account for an estimated 86% of the deaths and 77% of the disease burden in the Region."[2] NCDs tend to be chronic diseases, and they result from combinations of genetic, physiological, environmental, and behavioral factors. NCD prevention addresses the risk factors, such as tobacco use, physical inactivity, the harmful use of alcohol, overweight, and unhealthy diets. Identification of persons and populations at high NCD risk and the subsequent positive life-style modification processes are at the core of NCD prevention.

The ongoing NCD 'epidemic' is causing great human suffering, loss of health and life of the individuals, and consuming enormous amounts of funding and other resources in the society. In Europe, chronic care takes up 70 % to 80 % of healthcare costs. This means that the European Union (EU) spends €700 billion (€700 000 000 000) per year on healthcare costs associated with chronic care, and the amount is expected to increase in the future. **Only 3 % of health budgets of the OECD countries is spent on disease prevention and health promotion**[3]**.** In the modern European information society, information and communications technology (ICT) could and should be harnessed more efficiently in the fight against NCDs than what is currently happening.

ICT is creating a paradigm shift in healthcare: evidence-based ICT systems support the individuals to take themselves the responsibility of their health. The aim is to empower the citizens with the knowledge and tools, and with the responsibility and will to care for themselves. The paradigm shift should result in the client being in the center. ICT is also used to train the individuals and professionals in this regard.

ICT for NCD prevention and health promotion cannot be brought about without cost. The development, validation, implementation, maintenance, etc. of the associated ICT tools and systems require resources. However, as healthcare ICT systems in general continue to be developed, the costs associated with the NCD prevention and health promotion functions might be alleviated by realizing the functions as an integral part of the overall systems development process.

The ICT enhanced paradigm shift in health services can radically change the organization of the related service organizations. For example, for self-care clients, required labor resources might be reduced and directed to help those in greater need, e.g., people with multiple disorders. The resulting redistribution of costs and resource usage can be an opportunity to enhance the healthcare system for the benefit of the citizens, or a threat if the change is not governed with the big picture clearly in mind, but say, executed only to save money from some healthcare sectors or to divert funds to ICT per se. It is also uncertain how the private health insurance sector will respond to the ICT tools for NCD prevention and health promotion, and to the overall paradigm shift. There are several stakeholders with different

interests. The paradigm shift is generating new markets and bringing new actors in to play; for this, new rules are needed. Finally, ICT for NCD prevention and health promotion should be realized with the equality of the citizens in mind, so that no demographic group is left behind.

In this position statement, we give a set of recommendations regarding the identified NCD prevention and health promotion related challenges for which we see ICT-based solutions. The recommendations are intended to promote and enhance the usage and effectiveness of ICT-based solutions in NCD prevention and health promotion. The domain is vast and multifaceted. In this position statement, we do not address the associated technical, legal, privacy, data protection and localization, public opinion, ethical, or other similar challenges. All these matters must be solved for healthcare ICT and eHealth systems in general. The recommendations in this position statement can be realized in the same frameworks or systems. However, the recommendation on data linkage may require specific attention in this regard. A white paper related to this position statement will be published later. In the white paper, background and examples of NCD prevention and health promotion will be given.

Scope and Limitations of the Usage of the Position Statement

This position statement is concerned with ICT for NCD prevention and health promotion, with primary prevention as the main target. However, many of the recommendations are relevant and applicable to most phases of NCD control, including secondary and tertiary prevention, care, treatment, and rehabilitation.

It is to be noted that the recommendations are only concerned with ICT, and particularly with its usage possibilities. No part of this position statement may be used to promote or discourage any particular means of health promotion, NCD prevention, treatment, or other such matters. Information security, ethics, and many other aspects associated with healthcare-related ICT systems are considered separate issues, and are not addressed herein.

No medical advice may be drawn from this position statement. Possible legal aspects related to the matters presented have not been considered, and nothing presented in this position statement may be taken to imply legality. Whereas care has been taken to ensure correctness of information, however, no responsibility of errors or possibly misleading information is accepted.

Rationale and Discussions

1. **Noncommunicable disease (NCD) prevention and health promotion can increase life expectancy and the quality of life, and decrease healthcare expenditure and indirect costs to the society and European economy. Information and communications technology (ICT) should be utilized to enhance NCD prevention and health promotion at many levels and in numerous ways.**

The main target of disease prevention and healthcare work is that as many citizens as possible are healthy, and that for as many as possible of those affected by NCDs, healthy life could be

restored as efficiently and early as possible. Implemented appropriately, this is may also reduce the associated costs.

In Europe, ICT capabilities and infrastructure are already at a level capable of supporting NCD prevention and health promotion tools. It is evident that many individuals are drawn to ICT-based solutions. These facts are now at our disposal to create an effective coordinated and evidence-based ICT ecosystem for all levels of NCD prevention and health promotion. Further, ICT should be utilized throughout the self-care and healthcare practices in an integrative and holistic fashion.

2. **Childhood obesity and mental disorders are crucial and potentially highly effective targets for ICT applications. Tailored functionality for their prevention and control, along with the NCD prevention functionality for the other groups, should be built in the related ICT systems.**

Halting the rise in childhood obesity was one of the priorities set by the Maltese Presidency of the Council of the EU. Increasing prevalence and the numerous adverse effects of childhood obesity may result in huge healthcare challenges in the future because childhood obesity is associated with a multitude of health problems at different stages of life. Here, we wish to remind of this challenge, and recommend creating effective ICT-based solutions tailored to fight childhood obesity alongside the fight against other risk factors.

Many of the mental problems are manifested already in childhood. Thus, the prevention of mental problems during childhood could lead to better life-long mental health. ICT systems should be devised to empower the parents and families with evidence-based information and tools to identify and manage the obesity and mental disorders of their children. The systems should also guide them to appropriate evidence-based self-care chains, or if necessary, to qualified professional healthcare.

Children, adolescent, and also the elderly are particularly vulnerable to NCDs and have special needs compared to the general working-age population. A notable portion of the retired are interested in their health and have time and money. They also have the ability to use ICT, at least if assisted by their younger relatives. On the other hand, health risks accumulate with age. The needs of the young and elderly should be explicitly taken in to account when creating ICT systems for the general population and for the numerous health promotion, life style modification, NCD prevention, and healthcare targets.

3. **NCD prevention and health promotion functions should be built in to all appropriate health ICT systems. This also includes functions for planning preventive actions and for the surveillance of the effects of the preventive work. NCD prevention and health promotion functions should also be built into the eHealth infrastructure the European Commission is currently working on[4].**

Whereas stand-alone ICT systems targeted to NCD prevention and health promotion are of help, it can be expected that to be most effective, the systems should work seamlessly together with the evidence-based, holistic self-care and healthcare chains provided by professional public and private healthcare providers, and in concert with appropriate

governmental and qualified non-governmental organizations. This is important not only to ensure effective and high-quality care, assistance, and follow-ups of individuals, but also to help in designing preventive strategies and actions at population level. For population level strategies and actions, it is crucial to know the effects of the past population level interventions. This knowledge can only be produced by effective monitoring and surveillance; here, appropriately implemented ICT systems are of great help, maybe even prerequisites.

4. **ICT should be utilized to provide linkage between data on labor, employment, consumption, education, social welfare, possible other relevant data, and the electronic health records. Broad ICT-based data linkage has the potential to amplify NCD prevention and control to an unforeseen level. Data linkage requires that the privacy and protection of all individual data can be guaranteed.**

There exists an important link between labor, employment, consumption, education, social welfare, and other data sources with the electronic health record. Realizing this linkage in ICT systems would have major potential to transform the healthcare. If we were able to overcome the legal, commercial, and ethical barriers to broad data linkage, and to guarantee data protection and privacy, the potential for NCD prevention and control would be truly amplified.

It is very important to understand the burden and risk of NCDs by age, sex, locality, and by as many social and geographic variables as possible. This is only possible with the help of ICT. Knowing the demographic and geographic distributions of risks allows us to assess inequalities in health, discern causes, target vulnerable populations, and provide services proportionate to need. Thus, data linkage facilitated by ICT systems has the potential to discern inequalities in health distributions.

5. **ICT-based risk assessment systems should guide the identified high-risk individuals to the appropriate evidence-based self-care chains, or to professional care chains or interventions, as appropriate.**

Several existing ICT solutions, targeted at NCD prevention and health promotion, offer functions that are of interest to the public, but in general do not refer the identified high-risk individuals to evidence-based self-care chains, or to healthcare chains or interventions provided by qualified healthcare professionals. On the other hand, the existing evidence-based care chains at the professional healthcare providers are not, in general, supported by client ICT systems. Thus, the clients will not receive the full benefits of the ICT they are using. The client ICT solutions that assess NCD risks should include functionality to guide the identified high-risk individuals to verified evidence-based self-care chains, or if necessary, to appropriate professional healthcare chains.

Effective self-care chains can empower the individuals to take better care of themselves and support positive life-style modifications. The client tools and the decision-making aids of the healthcare professionals must also be able to catch the individuals that may not be left to self-care alone; the systems must facilitate guiding such individuals to the healthcare services for individualized education and care. Such systems could also facilitate fruitful meetings between the individuals and healthcare professionals, and the necessary follow-ups and documentation.

Empowering citizens to care for themselves using evidence-based information and tools will result in a paradigm shift in healthcare. At the same time, conveying medical information correctly to different individuals is challenging. ICT systems could be created to facilitate mediated access to medical information, and educational ICT could be used to augment ICT-based communications between the healthcare professionals and individuals.

Before any of this can take place, citizens must be lured to use the risk assessment tools. These ICT-based client tools, including the systems that the public uses to obtain evidence-based information, assess their NCD risk factors and predict risks, and to store self-monitoring data, could be provided on the same ICT platforms that they use to book appointments and check their laboratory test results. This way, the individuals could be more inclined to check their personal risks and to provide their information to the healthcare professionals. In the same online session, the identified high-risk individuals could be immediately guided in to an appropriate self-care or professional healthcare chain.

The risk assessment and decision making aids for professionals could analogously be directly linked to the appropriate ICT-enhanced care chains and to the client ICT solutions to engage the clients in the discussion and intervention. I.e., the professionals should have at their disposal the counterparts of the client ICT tools. This ICT should provide the professionals with tools to initiate discussions on the spot when they meet the individuals, so that the professionals would not dismiss the high-risk cases appearing in front of them.

It is unethical to perform a risk assessment without providing the subsequent care processes in full. This involves a plan for guiding the identified individuals in to the verified evidence-based self-care or professional healthcare chains, which must be in place. In addition, adequate healthcare resources must be allocated to all levels to receive and take care of the identified individuals.

This recommendation should be implemented jointly with the next recommendation.

6. **Preventive ICT solutions should be designed as parts of care chains. Preventive ICT best practices could be included in the NCD prevention and management guidelines, as well as in the care chains associated with NCD prevention.**

In general, NCD prevention guidelines and care chains do not guide healthcare providers to utilize ICT-based solutions. When updating the official care chains, it should be considered if best preventive and self-care ICT practices could already be formulated and included in the medical care chain documentations. For this, a multi-professional board could be assembled with the competence to define easy to use and appealing ICT systems based on verified evidence-based information and practices.

This recommendation should be implemented jointly with the previous recommendation.

7. **Qualified healthcare actors should actively produce evidence-based ICT solutions for NCD prevention and health promotion to overcome the corresponding non-evidence-based products on the market. The evidence-based ICT solutions products should also be effectively advertised.**

Health-related mobile apps are numerous and popular, and the public is interested in health promotion, which is a hot topic in mass media, including in yellow papers and online blogs. This has created a market for purely profit-seeking actors, sometimes providing non-evidence-based solutions, which may not provide the desired effects. Analogous but evidence-based tools, provided and advertised by qualified healthcare actors, should be employed to fight this trend. For example, providing high-quality evidence-based information is one simple strategy to prevent misleading information. Legislation should also be implemented to overcome the non-evidence-based information and actors in the health domain.

8. **Large-scale healthcare ICT infrastructures should support future genetics-based NCD prevention.**

Genetics-based and personalized medicine is on the rise, and holds great potential for personalized preventive work. Currently, preventive actions work best at population level, whereas it is difficult to predict exactly what actions affect the NCD outcome of a given individual. Utilization of genetic information could change that; self-care and professional interventions could be tailored specifically for the individual in question. It should now be ensured that this potential can be utilized as new, scientifically proven methods appear. This would require that the preventive and healthcare ICT systems supported this new data. Genetic testing and the subsequent individualized interventions should be included in the ICT-enhanced self-care and professional healthcare chains, and the healthcare professionals should be trained to understand and utilize the new methods. Research and development will be crucial for devising new genetic tests for NCD prevention. Further, ICT could be utilized in informing the public about the new methods, and in promoting the acceptance of evidence-based genetic testing for NCD prevention.

9. **Healthcare professionals should be able to utilize self-assessment data from personal apps and gadgets in the preliminary assessment of the need for proper risk assessment or medical testing. For this, a certification procedure should be devised that was lucrative to the small and medium-sized enterprises and made the data trustworthy for the healthcare professionals.**

A plethora of consumer devices exists: gadgets, apps, and online services are used to track physiological parameters and physical activity, among other things. Most of these devices are not medical devices carrying a CE marking. Obtaining CE marking can be very costly.

It is expected that health-related apps, gadgets, etc. that are not approved medical devices, include systems that are not evidence-based and may not always fully confirm to the good practices of healthy life, or may not provide proper information security, among other possible shortcomings. Some of these systems may be malfunctioning, provide questionable and untrustworthy data or advice, and their sole purpose may be to generate revenue for their providers.

Nevertheless, reviewing self-assessment data would be highly beneficial for the healthcare professionals to determine the need for actual NCD risk assessment and medical diagnostics. It would also be beneficial allow storing trustworthy self-assessment data in patient

databases. Thus, it is recommended to put in place a light certification procedure for such self-assessment devices, apps, gadgets, online systems, and other ICT systems of similar effect and usage, including, for example, evidence-based questionnaires. For this, a rather large certification body would be needed, which could define the certification criteria, perhaps tailored for different client groups separately. Such certifications could also help in weeding out possible non-evidence-based or fraudulent devices, apps, etc. from the market. The usage of the data from non-CE marked consumer devices, even if certified, could still be limited to the pre-assessment of risk or need for medical diagnostics, and only CE-marked medical devices should be used in making the actual diagnoses.

10. Implementing "eHealth Action Plan 2012-2020 - Innovative healthcare for the 21st century"[1] by the European Commission is strongly recommended.

Implementing the action plan[1] is recommended.

References and Further Information

All internet links were accessed on 17 February 2018.

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