

Rethinking Health

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Abstract— Lifestyle is a key determinant in the prevention and management of chronic diseases. If we would exercise regularly, eat healthy, control our weight, sleep enough, manage stress, not smoke and use alcohol only moderately, 90 % of type II diabetes, 80 % of coronary heart disease, and 70 % of stroke could be prevented. Unfortunately, global health statistics show that health promotion campaigns and healthcare have failed to persuade people to change and manage their lifestyles. A disruptive solution to this “tsunami” of chronic conditions is needed to radically improve people’s abilities to manage their health.

I. INTRODUCTION

THE need to reinvent healthcare has become obvious in the course of the past 10 – 15 years, when several drivers have emerged that interactively push for a systemic change in the ways that health services are organized, delivered and reimbursed.

On the demand side societies are graying, our lifestyles are projected to lead towards a huge increase in chronic conditions and we are better informed of what medicine can do. On the supply side biology based medicine (personalized medicine) has improved our understanding of diseases, their diagnostics and therapies. Parallel to this, the role of patients has changed fundamentally from a passive object of care to a proactive partner and co-producer of their health and care. Finally, ICT enables the integration of data and best practices, the virtualization of certain health services and resources, and access to services anytime anywhere.

Concerns over health outcomes and increasing health expenditure have lead countries to look for ways to reform their health systems. Numerous reports, papers and books have been produced over the years, but no consensus has emerged on how to service the increasing demand (see e.g. WHO and OECD web sites [1, 2] and [3, 4]).

This paper (and the mini symposium it belongs to) outlines a research agenda for a disruptive solution to the problem. It is based on ICT enabled services that allow individuals to take a proactive role in the management of their health and care.

II. PREVENTING CHRONIC DISEASES THROUGH CO-PRODUCTION

The seven most important risk factors leading to chronic

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diseases and premature death (high blood pressure, high cholesterol, obesity, inadequate fruit and vegetable intake, physical inactivity, excessive alcohol consumption and smoking) are all lifestyle related. The good news is that chronic diseases can be prevented and that their progress can be slowed with secondary and tertiary prevention activities. The bad news is that e.g. in Europe nearly 80 % of the disease burden is due to chronic conditions and diseases.

Another way to view the problem is through health determinants (see table below). These show that the most important determinant is “nurture”; our behaviors, lifestyle, environmental factors and societal circumstances [5].

Table 1. Health determinants [5].

Health determinant	Description	Impact on premature death
Healthcare delivery system	Quality and efficacy of healthcare services	10 %
Nurture (Exogenous factors)	Behavioral patterns, lifestyle, environmental factors, societal circumstances	60 %
Nature (Endogenous factors)	Genetic predispositions, acquired genetic changes	30 %

In summary, the facts are the following:

- We are facing an increase in chronic diseases.
- We are already spending most of our health budgets directly and indirectly to the care of chronic diseases.
- Chronic diseases can to a large extent be prevented and managed, if people would change their health behaviors.
- “But people are not rational beings. We are more likely to focus on tangible things in the moment rather than long-term uncertain benefits. So we persist in participating in unhealthy behaviors that provide short-term pleasure and lead to downstream sickness.” [6]

We should all lead lifestyles that are based on healthy behaviors. But most of us don’t. Evidently, public health promotion campaigns and healthcare are not enough to persuade people to pursue and lead healthy lifestyles.

What more could be done? Is there a way to engage people to manage their health and lifestyle? Could ICT be used for this? This was the focus of the EU funded PREVE¹ project, which has developed a research agenda to address

¹ PREVE was a roadmapping project that ran from December 2009 to November 2010.

these concerns [7].

III. PROACTIVE MANAGEMENT OF HEALTH AND CARE

PREVE’s research agenda for ICT enabled disease prevention is based on a *co-production of health* concept (CPH).

Health behaviors are determined by our daily activities. We interact with our environment in multiple ways at work and especially outside working hours. Our decisions and choices are influenced by our family, co-workers, hobbies, preferences etc. All of this takes place 24/7. Our environment therefore can be viewed as comprising of multiple co-producers that together with us co-create our health. These include e.g. family, work, shops, restaurants, leisure activities, and of course healthcare.

Our contacts with healthcare are more infrequent, especially if we do not yet have a diagnosed chronic condition. Healthcare professionals are co-producers of health. Their contribution will vary according to Figure 1; at the other end (100 % citizen) are people who manage their health with little or no interaction with healthcare. At the other end are patients who are dependent on healthcare services. All these parties including the citizen / patient constitute a *network of co-producers of health*, where people navigate their lives and in doing so interact with the CPH network.

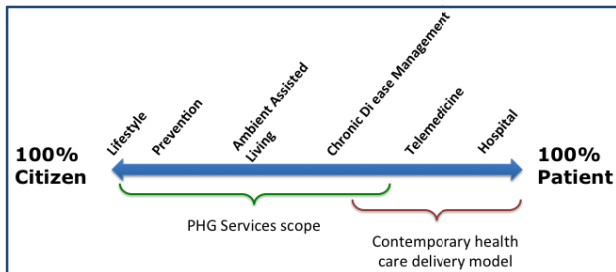


Figure 1. Digital Health Continuum.

The CPH model is quite different from the traditional healthcare model (see Table 2). The traditional model is labeled as “outsourced” and the proactive model as “insourced”. These terms are used to contrast the disruptive change, which needed on both sides. Patients who have been trained to go and see a healthcare professional when they have health problems and then to comply with the “prescription” of what to do will have to insource part of the responsibility of what to do. Similarly healthcare professionals will have to let go of part of the responsibility and work with patients on a peer-to-peer basis both being experts of their own domain; healthcare professionals being experts of medicine and patients being experts of their life.

At the healthcare side incentives and structures would need to be adjusted to make the proactive co-producer model possible and attractive to healthcare providers. Furthermore, healthcare professionals may need new skills in order to be able to function in their new role of a co-producer of health.

Similarly, at the citizen / patient side, people will need to

be provided with information, education and training, and tools and services that enable them to assume the proactive role.

Table 2. Co-Producer Model.

Traditional Care Model “Outsourced”	Co-Producer Model “Insourced”
Illness	➔ Management of health and care
Reactive	➔ Proactive
Episodic	➔ Continuous
Hospitals	➔ Co-producers (24/7), incl. healthcare

IV. RESEARCH AGENDA FOR DISEASE PREVENTION

In order to create a health supportive environment and to provide people with services to help them to navigate their health journeys three interleaved research tasks are needed:

1. Development of *Personalized HealthGuides* (PHG’s) that engineer awareness and intention, augment people’s power to take decisions, and being proactive in taking responsibility for their health. PHG’s facilitate communication with co-producers, with an EHR and PHR, and contextualize data, providing personalized evidence-based information for shared decision-making with professionals and networking with other users.
2. Creation of a citizen-centred and ICT-enabled *ecosystem* with a demand-driven service model where users (supported by PHG’s) interact with other co-producers of health in their private or professional environment.
3. Creation of *policies, incentives, regulations* etc. that make our environment healthy and encourage our co-producers to provide goods and services, which are good for our health.

In the following some aspects of the PHG’s will be elaborated briefly. The other two research tasks will be covered by the other papers submitted to the minisymposium.

V. HEALTH NAVIGATION

PHG’s that could help people to navigate their health journeys can be illustrated with two concepts from outside the disease prevention domain, namely the GPS navigator and Tamagotchi [8]. We use GPS to navigate from one place to another. A *Personalized HealthGuide* could be the navigator that supports us in managing our choices in our everyday life. As some may remember, Tamagotchi was an electronic toy that you had to care for to keep it alive. We could think of a dynamic *Virtual Individual* that one would be required to nurture to keep it alive by making healthy choices during one’s health journey. The VI model would comprise of the user’s profile, i.e. risk factors, health behaviors, personal values, preferences, intervention goals etc.

Technologically the system could comprise a mobile

handset with enough intelligence and connected to cloud based computing resources. The business value proposition could be based on the services that PHG's render to users and on user experience. The crucial question, however, is what would make them intelligent and at the same time interesting and desirable?

The challenge that is embedded in this is that people are different. We are motivated by different things both internally and externally, our life situations are different, our social environments and monetary resources differ etc. A system would need to be "tuned to a person" (personalized) in order to be effective.

Privacy and intrusiveness aspects also need to be considered. In general people don't want use solutions that constrain their normal life.

VI. CONCLUSION

Pieces of this future exist today, such as virtual exercise coaches, diet calculators, PHR systems etc. The technologies that are required to power these tools are emerging, such as persuasive technologies. Mobile phones and cloud computing are examples of how the ICT services are evolving to enable intelligence and decision support to be shared in mobile conditions.

There is a huge business potential in this for all actors from device manufacturers, application developers, IT service providers all the way to the actual healthcare service providers. Cutting down the barriers that are holding back the transition requires work along the lines suggested by the PREVE research agenda.

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