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The Future of Digitally Enabled Health Coaching – A Proposed Model

Charalampos Kyfonidis, Marilyn McGee-Lennon
Computer and Information Sciences
University of Strathclyde
26 RICHMOND STREET G1 1XH, Glasgow, UK
[charalampos.kyfonidis;marilyn.lennon]@strath.ac.uk

Abstract. The epidemic of chronic diseases has started worrying health bodies. The costs of dealing with such a problem (time, money and personnel) are continuously increasing especially with an ageing population. This paper proposes a conceptual large scale digital health coaching intervention model that could be applied by any public health body to design, implement or rationalise digital health coaching solutions. The model aims to support the increase of patient empowerment and the decrease of costs by redistributing the available resources more efficiently across the whole eco-system with the use of Artificial Intelligence coaches. The model is not targeting the replacement of human presence by computers, but a coaching strategy that will enable, assist, promote interaction and help automate (where needed and possible) resource consuming processes.

1 Introduction

In 2006 the World Health Organisation referred to chronic diseases as a "global epidemic"[1]. In 2012 chronic diseases were the leading cause of mortality with more than 21 million deaths worldwide[2]. In the UK, people with long term conditions account for 50% of all GP appointments, 70% of all inpatient bed days and 70% of overall NHS's expenses [29, 37]. As a consequence, health-care bodies have to spend immense resources (time, money and personnel) in order to ameliorate the impact of treating patients with long term conditions and diseases. This epidemic of chronic diseases has a direct impact on the economy and increasingly is a plausible concern from governments, public bodies and global organisations [41] on how these rising costs could be mitigated.

According to Golubic [16], the main reason behind the development and progression of preventable chronic diseases is unhealthy lifestyle. People with diseases such as arthritis, diabetes, obesity, cardiovascular disease,

1 WHO 2006 - Chronic disease handbook: http://www.who.int/chp/advocacy/en/

2 WHO 2014 - The top 10 causes of death : http://www.who.int/mediacentre/factsheets/fs310/en/

osteoporosis, arrhythmia etc. should have a healthy diet and exercise on a regular basis. Solutions therefore must focus on encouraging and supporting health behaviours and lifestyle choices. The unsustainability of modern -western- healthcare systems is also partly a result of the tendency to focus in the treatment of diseases rather than their prevention [18]. Since a patients' condition is dependent largely on their self-care and well-being [13], motivation is an essential aspect of their treatment plan and solutions need to address this. In 95% to 99% of those cases the health conditions are managed by the patients themselves [22] and unfortunately in most cases, patients lack a full understanding of their condition and how to manage it [4].

The goal of this position paper is to provide some insights on how the well-being of chronic disease patients can be enhanced by a more integrated and holistic health coaching model. This work tries to eschew the reactionary approach of cutting costs without caring about the whole ecosystem; instead it proposes a conceptual intervention model that can be used to balance the goals of treating patients as individuals and promoting the sustainability of health-care systems.

2 Background

2.1 Persuasion and Behaviour Change

Behaviour change is the ultimate goal of many health and wellness interventions and programmes. It is achieved through continuous feedback cycles where the subject is setting goals, identifying competitive goals and resetting goals by taking into account current status [8]. Behaviour change is hard to achieve, even if you manage to change someone's attitude [17] and can involve methods and techniques to persuade or motivate the user to choose a particular behaviour..

Persuasion is a way to provide incentives. It is a social interaction that consists of two social entities and a stimuli-message [21]. The main idea behind persuasion is to provide motivation and ideally influence the subject to abandon one set of behaviours and to adopt another [27]. As stated in the literature [14], persuasion can be achieved through social cues and strategies like reduction, tunnelling, tailoring, suggestion, self-monitoring, surveillance and conditioning.

There are three different types of persuasion [19]:

1. Interpersonal persuasion: When someone tries to persuade another individual through personal interaction.

2. Computer-Mediated persuasion: When someone uses a computer in order to persuade another individual (e.g. online advertisements).
3. Human-Computer persuasion: When an artificial-computer agent tries to persuade a human (e.g. health coaching apps such as UbiFit [10]).

Persuasion is a theory that has been vastly researched and a lot of time and effort is spent towards its use as a countermeasure for the impacts of chronic diseases. Persuasion is the principal behind almost every health coaching intervention.

2.2 Health Coaching

A common practice for helping patients to achieve their health-related goals by enhancing their well-being is called health-coaching [32]. Even though there is no unanimity on the definition of what health coaching is [40], a good definition is " *a practice framework that complements patient teaching and supportive therapy as a method for enhancing self-care and self-management behaviour for people with chronic disease and their family members*" [25].

Health-coaching is based on the principle of authority [14], according to which people tend to defer to authorities [9]. People, by presuming that authorities are knowledgeable and powerful, expect their guidance, recommendations and helpful information [14]. It is a purely patient-centred approach and it is based on the interpersonal relationship of the patient with the coach. The coach in that context is a professional educated and experienced in behaviour change in health matters [39].

By taking advantage the aforementioned facts, a lot of health coaching programmes have been established and running in US and UK and have instituted it as an important part of chronic conditions' management [38]. In those programmes clinicians are educating, encouraging and helping patients to acquire skills and tools in order to actively participate in their care. Hence, they can manage their condition and reach their self-defined health goals [3].

Unfortunately, even though this approach has multiple benefits, for both clinicians and patients [30], and is very effective [3] it is also very expensive [38]. Under normal circumstances, primary care clinicians spend 15 minutes for every patient and are striving to fit multiple agenda items into that time [31]. Hence, they cannot meet the needs of the numerous chronic conditions patients and thus cannot effectively coach them. Moreover, it is very difficult to scale up this kind of coaching [38] because a lot of time and resources are needed in order to recruit and train clinicians.

2.2.1 Remote Health Coaching

Remote coaching is defined as any coaching interaction that takes place from distance [33]. Remote coaching models are proven to be beneficial and can replace regular face-to-face coaching [34]. Mobile phones can facilitate remote coaching interventions and patients can easily collect data about their activities and physiological measures [11] allowing the feedback needed to be concrete and targeted to their particular case. Nonetheless, the increasing number of patients [30], demands further automation of health coaching. Consequently, many researchers have proposed and implemented computer agents as coaches.

2.2.2 Artificial Agent Coaching

A health coach does not necessarily need to be human. One of the main advantages of artificial agents- compared to humans is their ability to automate processes. The automation of the decision support process, when it comes to integrated health-care, can be a very helpful tool [18] and reduces costs [24]. It can be away of providing, personalised information for the patient (by tailoring evidence from the literature in his profile), reasoning support, guidelines and instructions [18]. Automation can also however introduce new difficult problems such as (i) issues of (real or perceived) responsibility and risk when replacing human interactions with automation, (ii) issues of (real and perceived) privacy and security when patient information flows are changed and (iii) issues of feasibility of implementing such automated frameworks in terms of what (artificial intelligence) technologies already exist and what still needs further research and development in order to fully support self-management.

2.3 Empowerment and Peer Support

The main goal of every health coaching system, independently of the intervention type, should be the empowerment of the patients. The term patient empowerment describes the augmented ability of patients to proactive perceive, impact and control their own health status [7]. Another interesting approach for the management of chronic conditions is peer support. Peer support occurs when people who have the same condition provide knowledge, experience, emotional social or practical help to each other [30]. Such support is essential since, the information that are generated through personal experiences are usually the most influential [2]. When it comes to coaching, peer support has the advantages of a low-cost intervention that reduces hospital stays, limited access to care [12] and generally has capability of

helping individuals to alter their own behaviour [23]. Another advantage of peer support is that it can be realised through various modes of interaction and involvement, in different settings and structures [12].

2.4 Summary

Health coaching is proven to be beneficial [38] for all stakeholders of public health systems [30] and thus should be widely adopted for the treatment and education of chronic disease patients. Nonetheless, the variety of intervention types and approaches has, thus far, prevented the foundation of standard rules and guidelines for health coaching. Consequently, health coaching cannot uniformly be applied into routine health care [26].

The key for a positive outcome in a coaching process, which is independent of the intervention used [1], is the interpersonal relationship between patient and physician. Hence, even though artificial intelligence(AI) agents can be used for health coaching and provide a sense of social interaction [15, 28] they might never totally replace this interpersonal interaction. However, due to the increasing number of patients, physicians and clinicians cannot solely deal with all the patients. Therefore, a hybrid model of coaching system, incorporating peer support, artificial and human coaches, should be researched.

In order to set the foundations for such an intervention and keep a balance between quality and cost, the level of involvement of AI and human coaching should be further examined. Therefore, the following research questions need to be answered:

- How and what can be artificialised in the practice of heath coaching for chronic diseases?
- How artificialisation will ameliorate the well-being of patients with chronic diseases and empower them?
- How a potential incorporation of AI coaches will abate health-care systems costs, while retaining each patient's singularity?

3 Proposed Model

The proposed approach of this paper comprises of a conceptual large scale health coaching intervention model that can be applied by any public health body. The model could be implemented as a cross-platform application including some or all of web based interventions, wearable technologies and monitors, mobile applications and a combination of sensed and self-reported

information inputted by the patient, their friends, family or peers and associated health and social care professionals.

The model unburdens clinicians and physicians and distributes workload to AI coaches. By downscaling the professionals' involvement to the coaching process and increasing peer support networks and AI coaching, an instant cost reduction will be made. These coaches will not totally cease the interpersonal interaction but instead reduce it to necessary intervention. The implementation of such a model requires some resources in order to be developed, but the long term saving should cover the investment.

3.1 Levels

3.1.1 Peer Support Level

On the lower coaching level, people are forming social networks and peer support groups in order to support and inform each other. Hence, empathy, compassion and other similar feelings can be created and the patients can feel part of a team and motivate each other. The application should help the patients create, administrate and edit peer support forums and blogs. Moreover, it should exploit the power and widespread of social media and incorporate some of their features (eg likes, sharing), in order to enhance the peer support process. Hence, patients can save time and share experiences more easily.

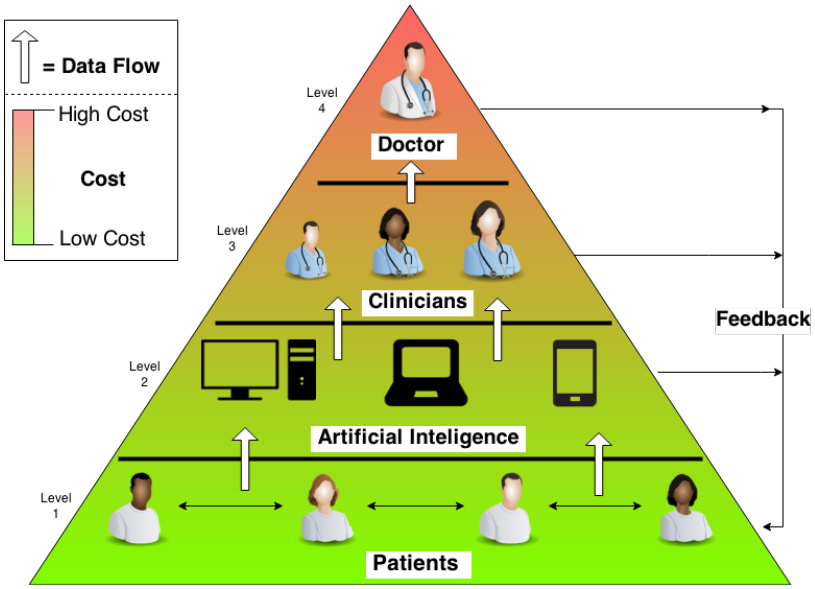

Figure 1. A multi-level hierarchical architecture that incorporates human and AI coaching. The higher in the pyramidal structure the fewer resources needed.

3.1.2 Artificial intelligence level

On the second level, coaching is taking place, where computers and smartphones are monitoring and guiding patients at frequent intervals. The application should be able to collect and use data provided by monitoring devices. Guidance by the AI coaches is limited to advice about everyday issues. This advice will be tailored to each patient. This level can also convey raw monitoring or processed data about patients' progress to the higher levels of the architecture.

3.1.3 Clinicians' level

On the subsequent higher level, clinicians (nurses, social workers, medical assistants (MAs), community health workers or health educators [6, 20]) will be monitoring the overall progress of the patients' condition. The system can provide treatment suggestions to the clinicians for each the patient. The feedback from the clinicians does not need to be delivered in person but can be communicated through the application. Hence, an inbox-like message delivery can inform the patient about something that the clinician has observed in his case and give suggestions, praise, provide reassurance and reinforcement in order to alter behaviour and further motivate the patient [35].

3.1.4 Attending physicians' level

The last level is consisted by the patient's attending physician, an interpersonal relation of trust [36], which in some cases lasts for even years. This relationship and the authority of the physician (as a professional) [5] is proposed to stay as it currently is. Hence, the face to face interaction and coaching, does not need to be replaced by computer mediated interaction. The physician can use the system to monitor the everyday progress of the patient and explain to them how the specific outcomes impact his total condition. The application can gather all the data and produce reports and visualise data. Because of the previous' levels contribution to the coaching process the physician can intervene fewer times (in bigger intervals) and thus, gain time to deal with more patients.

4 Conclusions

The present paper proposed a holistic and multi-level conceptual model for digital health coaching. The aim of the model is not the replacement of human presence by computers, but a coaching strategy that will enable, assist,

promote interaction and help automate (where needed and possible) resource consuming processes.

The proposed model will ultimately enhance the management of chronic diseases, increase patient empowerment and decrease costs by redistributing the available resources more efficiently, across the whole eco-system. Therefore, it can potentially become a new standard for integrated health coaching interventions.

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