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mHealth: A cost-effective solution to chronic problems?

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Introduction

Lifestyle-related chronic diseases, or noncommunicable diseases (NCD) are responsible for more than 40 million deaths each year, with most of these deaths occurring in low and middle-income countries. Approximately 15 million of these deaths may be classified as 'premature deaths' as they occur in the age group of 30 – 69 years of age. Given that the aforementioned data does not include total NCD morbidity, the overall disease-risk burden is significantly greater than that reflected by the mortality data [1,2].

The following 4 groups of diseases account for more than 80% of the total NDC burden: cardiovascular diseases; cancers; chronic respiratory diseases and Type 2 diabetes [1]. The principle risk-factors associated with the 'group of 4' NCD include tobacco smoke, unhealthy diet, physical inactivity and the overconsumption of alcoholic beverages [1].

Cardiovascular disease is by far the largest contributor to global NCD-related morbidity and mortality, followed by cancer, chronic respiratory diseases, and diabetes [2,3]. The growing burden of chronic disease, which is fuelled by the synergistic effects of increasing globalisation, urbanisation, unhealthy lifestyle practices and ageing populations, demands a response to the challenge of having to cost-effectively care for growing numbers of chronically ill people [4,5].

The following 'take home messages' from an October 2014 editorial of the South African Medical Journal highlight some of the challenges associated with the burgeoning NCD burden [6]:

- "The accumulated losses to South Africa's gross domestic product between 2006 and 2015 from diabetes, stroke and coronary heart disease alone are estimated to cost the country US$ 1.88 billion"
- "Obese employees cost their employers 49% more in paid time-off than their non-obese colleagues."
- "Employers face additional costs in the form of high staff turnover and absenteeism, because these conditions are not only a source of morbidity but a leading cause of death."
- "By 2030, NCD will account for five times as many deaths as communicable diseases in low- and middle-income countries."
- "South Africa has a mounting burden of disease, with 40% of the population aged 35-44 years hypertensive."
- "Most South African people with hypertension are not diagnosed; of those who are, medication adherence is not optimal. As a consequence, a third of cases result in premature death or disability and two thirds of stroke victims are permanently disabled."

Chronic disease self-care

A significant proportion of the global NCD burden is associated with aberrant health behaviours, especially those related to lifestyle [2,3]. Health behaviours may be influenced by a broad spectrum of factors such as learning, social norms, reinforcement and modelling, genetics, emotional factors including anxiety, stress and fear, the severity of symptoms, personal beliefs and the beliefs of significant others, such as a spouse or partner and healthcare providers [7]. The increasing recognition of the relevance of health behaviours in determining health outcomes has fostered the development of biopsychosocial approaches to the treatment and management of chronic diseases [8]. It follows, therefore, that evidence-based empowering self-care behavioural interventions, rather than provider-driven biomedical interventions, should be at the forefront in preventing and treating NCD [9].

Acute models of care, i.e. care premised on expert healthcare providers interacting with so-called naive patients, have proved inadequate in addressing the complex needs of the chronically ill [10,11]. In general, acute ambulatory models of care are designed to provide treatment for those conditions requiring consultations of short duration and where, following diagnosis, treatments for the alleviation of symptoms are most often prescribed [12]. Chronically ill patients are, however, unlikely to have their healthcare needs met as a result of these brief directive encounters [11]. Research and innovative practice reveals that the successful management of most NCD, i.e. preventing the development or exacerbation of disease-related complications, is dependent on patient-centred self-management or self-care rather than on provider-centred acute models of care [12]. Evidence shows that between 80% and 95% of NCD-related health outcomes are determined by patient health-related behaviours [13,14]. Wagner, one of the authors of the widely accepted Chronic Care Model (CCM), stated that a central tenet of the CCM is patient self-management [12,13].

While the provision of healthcare has always been underpinned by a desire to provide for the patient's welfare, the practice of medicine has historically focused on provider-centred acute models of care. In acute care settings, patient participation is often limited to compliance with provider instructions, and with provider-patient relationships often paternalistic [15,16]. The directive approach to patient counselling is appropriate in some circumstances but not in all, especially not

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with the so-called diseases of lifestyle, where this counselling style has been shown to be successful in only approximately 10% of cases [17]. Unsolicited advice-giving by providers often leads to resistance to behavioural change on the part of the patient, and consequently to negative health outcomes [17].

Patient-centred care, which has been defined as "…healthcare that is closely congruent with and responsive to patients' wants, needs, and preferences" [16], encourages and facilitates patient involvement in healthcare decision-making with the result that the emphasis shifts from a focus on compliance with provider instructions to embracing the evidence-based chronic care paradigm that recognises the determining role of the patient in making day-to-day decisions about their care. Patient centredness is a foundational element of collaborative care and the practice of self-care [13,14].

The individualized care that characterises self-care in chronic illness has been described as a stepped process in which collaboration between patient and provider results in setting agreed health-related goals; developing care plans; accessing relevant health education and training support; monitoring of risk indicators and, where necessary, the escalation of care (i.e. referral) [18]. Supported self-care, monitoring and active follow-up, guided by evidence-based protocols, are the key areas of focus in preventing the development and exacerbation of disease-related complications [19].

Self-care, particularly in the areas of pharmacotherapy, lifestyle modification and the monitoring of clinical indicators (all of which are premised on self-managed health-related behaviours), is most often the defining component in the overall care continuum of major chronic diseases [20]. For example, self-care provides for approximately 95% of the care that persons with diabetes require [21].

Modifying health-related behavioural change is a time consuming and complex process often made difficult by the multitude of personal, societal and environmental influences in effect at the level of the individual, between the individual and others, and at the level of broader society [22]. The difficulties associated with behavioural change are exacerbated by the clustering of risk behaviours within individuals, e.g. smokers who may be overweight and lead a sedentary lifestyle [23].

The key role for providers in NCD care is to support the chronically ill patient's efforts to acquire the necessary tools and skills to be able to effectively care for themselves [15]. The nature of most chronic conditions dictates that patients should not be passive recipients of care but should be empowered to be actively engaged in all aspects of their care [12].

The task of the healthcare provider, in attempting to influence patient behaviour in the course of day-to-day clinical practice, is made difficult by a lack of time (work overload), lack of training and skills, the absence of an integrated screening and intervention approach applicable to multiple risk behaviours, as well as the mitigating influence of the provider's own behaviours and socio-ecological perspectives [22].

Rollnick et al, in discussing the training of healthcare professionals as facilitators of behavioural change in patients, state that the training of providers involved in promoting patient health behavioural change "…is sometimes viewed as an inconvenient by-product of a worthier endeavour: getting the patients to change" [20]. They caution against the oversimplification of the process of skills acquisition by providers who are charged with working with patients to effect behavioural change. A common but mistaken notion is that all that is needed is a workshop or two for the provider to be sufficiently skilled to influence behavioural change. Just as patients are unlikely to change behaviour overnight, neither are healthcare professionals. A balanced approach to training that is based on structured skills acquisition within the provider's real-world practice environment appears to offer the most promise [20].

Despite having access to a substantial body of evidence, healthcare systems generally only pay lip service to supporting patient self-care initiatives. There appears to be three main barriers to the provision of chronic condition self-care education and training: a paucity of trained and culturally competent personnel; the continued socialization of patients to dependant relationships with providers, and the reluctance of funders of healthcare to reimburse facilitators for providing self-care support [15].

mHealth

The practice of providing self-care support is well positioned to take advantage of two important current and developing trends, namely: health coaching and digital health technology, mainly in the guise of mobile health ('mHealth') [24-25]. The last decade has seen a plethora of smartphone applications ('apps') come to market. A systematic review published in 2016 estimates that between 2008 and the middle of 2015 more than 100 billion apps were downloaded from iTunes, and a further 25 billion from Google Play [26]. Of the many apps downloaded, it is estimated that more than 100,000 are health-related [26].

mHealth is being touted as a cost-effective solution to a number of the problems commonly associated with traditional chronic disease management interventions. The advantages associated with mHealth include: improved patient access to a range of holistic self-care and behavioural interventions via powerful and portable devices; asynchronous engagement with health portals and healthcare providers; easy and readily available access to health-related information, including 'ask the expert'; the provision of 'in the moment' and asynchronous psychosocial support, including behavioural feedback loops and peer-group participation designed to build self-efficacy and sustain motivation; goal setting and self-monitoring; symptom tracking and management [25-29].

Despite being 'pregnant with potential' mHealth has yet to fully deliver on its promise as a disease management tool in affecting health-related behaviour, symptom control and health outcomes [9,27]. Conceptually, and in research settings, there appears to be consensus that mHealth may prove to be a significant cost-effective chronic disease management option, especially with regard to NCD [9]. However, as is often the case with new technologies, challenges remain [9,25-29].

The following is a brief synopsis of some of the evolving mHealth opportunities waiting to be seized and challenges to be overcome [9,25-30]:

- The range of mHealth-based services aimed at fostering improved health outcomes should be based on the foundational principle of a productive interaction between empowered patients and their healthcare providers. The empowerment of individuals is dependent upon the achievement of certain proximal outcomes (e.g. increase in knowledge and expression of a willingness to change behaviour) as well as certain individual effects (e.g. improved self-efficacy and ability to engage with care support).

- Currently very few mHealth applications include evidence-based psychosocial and or behaviour interventions. It is important that targeted behaviours be well defined prior to the design and development process.
- In addition to informing and optimising behavioural change and health outcomes, design and development should address key factors such as healthcare settings, social and cultural values, ethical and legal considerations, access to and delivery of care, process and integration of care, cost of care, user–provider concordance and health-related quality of life.
- Adequate investment is needed in research and development of various behavioural and technological components, which will allow for the widespread scalable and cost-effective dissemination of cost-effective technologies.
- Provision of adequate levels of multidisciplinary expertise in the areas of design and development to ensure robust and clinically useful and functional technologies to support informed holistic self-care delivery. In addition, it is imperative that such technologies be easy to use, include strategies for optimising and maintaining user engagement and provide for the collection and collation of valid process and outcomes data.
- 'Speed of light' product development and commercialisation require flexible and iterative approaches to development that take cognisance of a rapidly evolving health technology landscape. While there are benefits in taking a minimum viable product approach, it does, to some extent, mitigate against comfort provided by the introduction of only tried and tested technologies.
- Research is constantly having to play 'catch up'. This could lead to scepticism and resistance from potential users which, in turn, may tend to sustain the translation gap between research and practice.

Conclusion

There is a plethora of evidence available to support the notion that empowered self-care behaviour is the key factor in determining chronic disease health outcomes, both in terms of prevention and treatment.

Empowered self-care requires productive interactions between skilled, motivated and proactive individuals and a range of accessible and appropriate cost-effective resources both human and technological.

The rapid and ongoing development of mobile technology, coupled with its widespread dissemination across the globe, has put the ubiquitous mobile phone into the hands of most individuals, both in developed as well as developing countries.

While mHealth research is still in its infancy, there is a growing body of evidence pointing to the utility of mobile technology in chronic disease care, including in fostering health-related behavioural change.

The key 'take home messages' arising from a review of the literature is that while mHealth undoubtedly possess inherent potential to improve chronic disease health outcomes, the design and development of applications and services requires the involvement of multidisciplinary expertise as well as the input of at-risk individuals, care providers and funders in order to ensure optimal effectiveness, i.e. usability, functionality and quality of content.

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