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Review

Do-it-yourself Healthcare: The current landscape, prospects and consequences

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ABSTRACT

The wider availability and increasing use of mHealth tools – covering health applications, smartphone plug-ins and gadgets is significant for healthcare. This trend epitomises broader trajectories in access to and delivery of healthcare, with greater consumer involvement and decentralisation. This shift may be conceptualised as 'do-it-yourself Healthcare' – allowing consumers to monitor and manage their health, and guide their healthcare consumption. Technology that enables data collection by patients informs them about vital health metrics, giving them more control over experiences of health or illness. The information can be used alone as empowered consumers or together with healthcare professionals in an environment of patient-centred care. Current evidence suggests a large scope for do-it-yourself Healthcare, given the availability of technologies, whilst mHealth tools enhance diagnostics, improve treatment, increase access to services and lower costs. There are, however, limitations to do-it-yourself Healthcare. Notably, its evidence base is less well developed than the availability of technologies to facilitate it. A more complex model and understanding is needed to explain motivations for and consequences of engaging in do-it-yourself Healthcare. That said, its introduction alongside existing medicine may improve quality and reduce costs – potentially improving health system sustainability whilst future generations – tomorrow's middle-aged and the elderly, will become more conducive to its spread.

Contents

1. What is do-it-yourself Healthcare?

The growth of mobile technology – and advent of mHealth (defined as medical services and health information delivered or enhanced through mobile communication and information technology [1] – has been significant in healthcare. There is wider availability and increasing use of mHealth tools – covering health

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Table 1
Consumer health informatics (CHI)[a] applications and clinical outcomes.

Disease area (number of studies)[b]	Type of intervention with evidence of significant positive effect on clinical outcomes	Primary outcome measured
Cancer (3)	Interactive video-disk shared decision programme	Anxiety and depression[c]
Diabetes (3)	Interactive computer assessment	HbA1c
Mental Health (7)	Computer-based psycho education, website offering information about depression; Computer-based cognitive behavior therapy	Center for Epidemiologic Studies Depression Score
	Web-based stress management system	DHE-S; NPY; CgA; TNFα
	Patient-centered assessment and counseling for exercise and nutrition via the Internet	Center for Epidemiologic Studies Depression Score
	Web based intervention	Reduction in childhood anxiety
	Group cognitive behaviour therapy	Test Anxiety Inventory; Anxiety Hierarchy Questionnaire
	Beating the blues	BDI; BAI; Work and social adjustment scale
	Group CBT; Internet based intervention	Treatment response after 1 year
Diet, Exercise or Physical Activity (5)	Computer tailored program with 6-months weight and targeted behavior's self-monitoring	Percent weight loss
	Behavioural internet treatment (BIT)	Body weight (kg)
	Tailored computer-automated feedback	Weight loss
	Interactive nutrition education program and internet counseling behavioural therapy for the Intervention group	Body fat[3]

Reference: Gibbons et al. (2009) [11].
[a] Gibbons et al. describe CHI as eHealth solutions tailored to consumers; the use of CHI applications is an aspect of "do-it-yourself" healthcare.
[b] The table presents those diseases with more than one associated study to illustrate different CHI applications in an area.
[c] Clinical outcome was found to have a significant positive effect.

applications, smartphone plug-in and add-on devices that enable point-of-care testing and gadgets such as wearable cameras. This trend epitomises a broader trajectory in healthcare, with greater consumer involvement and decentralisation. This shift may be conceptualised as '*do-it-yourself Healthcare*' which allows consumers to monitor and manage their health, and guide their healthcare consumption on their own, as well as with the involvement of providers. mHealth tools can be used by consumers and providers; however, we focus on the former, those relevant to do-it-yourself Healthcare.

Historically, information and data have been fundamental to improving public health and patient care, whether it was driving sanitary reforms in nineteenth century Europe, or recent quality improvement in surgery. Information was, however, largely in the hands of professionals. Technology at the hands of healthcare consumers democratises access, flooding consumers with health information like no previous innovation. The technology to collect and use data allows consumers to inform themselves about vital health metrics and monitor their health as well as self-manage conditions [2].

The availability of health applications – or, apps as they are popularly known, which run on smartphone operating systems, allows consumers to go further. In addition to self-monitoring and management, applications process data and provide interactivity, to give an element of self-assessment. This gives a critical ingredient, transforming self-monitoring into do-it-yourself Healthcare. This, in turn, widens both the potential for benefit and unintended consequences [2,3].

2. Do-it-yourself Healthcare in 2013

Due to the global reach of mobile technology, mHealth has enormous potential [3]. As of 2011, there were 5.9 billion subscriptions to mobile phones globally, double 2005. This corresponds to a global penetration of 86% [4], with 105 countries having more subscriptions than inhabitants. There are estimates of up to 17,000 available apps, with a projected 500 million app-users by 2015 [5]. Apps are downloaded for free or bought at a minimal price, directly lowering the cost of health information, and reducing time to generate data. Unlike other technologies, mobile-phones are widely adopted across socioeconomic and demographic groups. Use, in fact, appears greater among groups most in need of health interventions [6]. As such, mobile technology may narrow the 'digital divide', not exacerbate it.

So what technologies are available, and do they work? Technologies complicit in do-it-yourself Healthcare have been available for some years, with a range of self-monitoring devices available [7]. These are effective in self-monitoring blood pressure (BP) in hypertension and glycaemic control in diabetes, among others [8,9]. Self-monitoring combined with self-dose adjustment of anticoagulants reduces thromboembolic events [10]. The effectiveness of electronic tools, technologies, and applications that critically *interact* with consumers – albeit to a lesser degree of interaction some now available – has been assessed in 146 trials, in up to 11 disease/problem domains [11]. Applications were effective in improving health outcomes, intermediate measures and consumer engagement across a range of health settings, for example clinical outcomes in all seven mental health and all three diabetes studies, whilst improving the doctor–patient relationship in five out of eight studies (Table 1).

The United States Food and Drug Administration (FDA) recently forecasted 'decentralised care technologies', covering self-care and portable/mobile devices, will be among six technology categories in healthcare that will see significant innovation through 2018 [12]. This growth is exemplified by the wireless home-health market reaching US $4.4 billion in 2013, from US $304 million in 2011 [13]. In light of this growth (as well as consequences of mHealth solutions on patient safety – discussed below), bodies such as the FDA have begun to regulate applications. According to the FDA, applications that (1) are used as extensions of regulated medical devices, (2) transform a mobile platform into a regulated medical device, and (3) handle specific patient data for purposes of diagnosis or treatment present the greatest risks to patients, and thus shall be subject to its regulatory review [12].

3. Drivers behind do-it-yourself Healthcare

The rapid growth of technologies, described above, has been an obvious driver behind the growth of do-it-yourself Healthcare: the availability of technology leads to its use. This is not, however, the