original article

Adapting to the medium and the message

Willingness and confidence of COPD patients to use electronic devices for health information management.

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Numerous factors, including the aging population, are contributing to increased rates of chronic disease that are out-pacing traditional health care delivery. Efforts to influence health behaviours through non-traditional delivery of information have grown precipitously in the last 10 years (Vandelanotte, Spathonis, Eakin, & Owen, 2007; Davies, Spence, Vandelanotte, Caperchione, & Mummery, 2012). Non-traditional information delivery has focused on the internet, including web-sites, interactive programming, email notices, cell-phones and smart-phones. These media allow for transmission of high quality text- and image-based messages through web-sites, emails, and text-messaging. A spate of systematic and quantitative reviews of such interventions in the last few years, including four Cochrane reviews of the effectiveness of mobile phone messaging, have revealed great promise, but also limitations and gaps in understanding. The majority of empirical evidence suggests that device or internet based interventions are more effective than no intervention, but evidence is equivocal regarding whether such interventions are better than paper-based, land-line phone based, or other traditional interventions (Maher, Lewis, Ferrar, Marshall, De Bourdeaudhuji, & Vandelanotte, 2014). One reason might be motivational and behavioural factors influencing willingness and confidence to use information technology (IT) based media. The general willingness and confidence of targeted patients for using the media itself has been largely ignored in the development of technology-based or communication device-based interventions (Vandelanotte et al., 2013).

We will use Chronic Obstructive Pulmonary Disease (COPD) as an exemplar to explore these possibilities. Like most chronic conditions, COPD requires on-going self-monitoring of symptoms and adherence to pharmacological and non-pharmacological treatments. COPD is a respiratory disorder primarily caused by smoking, characterized by progressive, partially reversible airway obstruction, with increasing frequency and severity of exacerbations (O'Donnell et al., 2007). As lung damage builds up over years of exposure to an aversive agent, diagnosis of COPD tends to occur in late life (usually over 65 years of age). Symptoms include shortness of breath (dyspnea), cough, and frequent respiratory infections that can lead to reduced activity and deconditioning that exacerbate the condition (O'Donnell, et al., 2007). Pulmonary rehabilitation (PR) is recommended for COPD patients who remain symptomatic despite inhaled pharmacotherapy. There is substantial evidence of the benefit of PR in terms of medical outcomes and improved quality of life, largely believed to be associated with the educational components and improved functional and exercise capacity that increase activities of daily living and reduce severity of exacerbations (acute episodes of inflammation or infection) and associated hospitalizations (Criner et al., 2014). Although attendance at PR is quite good, subsequent adherence to exercise and other recommended behaviours is low (e.g., Fischer et al., 2009; Rodgers, Selzler, Haennel,

Wong, & Stickland, 2013; Sabit et al., 2008; Wong et al., 2014). Therefore, support to maintain adherence to chronic disease management behaviours is needed. COPD patients are an excellent target for internet- or device-based information and support because of the commonalities in post-rehabilitation prescriptions including the type and delivery of medications; the nature and treatment for symptoms; the need to maintain 'pulmonary hygiene' exercises; and the need to maintain exercise. Thus, message content is relatively consistent across patients, and is not novel following PR.

In a systematic review of internet-based approaches to cardiac rehabilitation, Munro, Angus, and Leslie (2013) identified only nine studies that revealed equivocal evidence of the intervention effectiveness. Four recent Cochrane reviews focused on mobile phone messaging for preventive care (Vodopivec-Jamsek, de Johngh, Gurol-Ugfanci, Autn & Car, 2012); facilitating self-management of long-term illnesses (de Jongh, Gurol-Urganci, Vodopivec-Jamsek, Car, & Atun, 2012); attendance at healthcare appointments (Car, Guron-Urganci, de Jongh, Vodopivec-Jamsek, & Atun, 2012); and smartphone and tablet self-management for asthma (Belisario, Huckvale, Greenfield, Car, & Gunn, 2013). Each review included only two to four studies; far too few from which to draw firm conclusions, and demonstrating the limited research addressing the effectiveness of internet-based approaches to maintaining health-behaviour change and chronic disease management in older people. Among the Cochrane reviews, for example, mobile-messaging had positive effects on diabetes care self-efficacy, but did not improve outcomes in other conditions (hypertension, asthma) or treatment compliance. Mobile messages improved attendance at health-care appointments better than no reminders, but similarly to land-line phone messages. Mobile messages can improve pre-natal confidence, vitamin protocol adherence, smoking cessation efforts, and reduce anxiety. One study examining cell phone applications (apps) to increase physical activity found tracking information (i.e., behavioral monitoring) was preferred (Rabin & Bock, 2011) suggesting people already knew what to do. Kirwan, Duncan, Vandelanotte, and Mummery (2012) found that a self-monitoring smartphone app increased adherence to a 10,000 steps prescription compared to no support. Thus, mobile apps seem to support self-monitoring, an important aspect of behaviour maintenance.

One of the expected challenges to effectiveness of internet or device-based interventions with COPD patients is their age (cf. Ammann, Vandelanotte, de Vries, & Mummery, 2013). There is abundant evidence that preference for internet and device use is negatively associated with age. In a sample of Australian adults, Short, Vandelanotte, and Duncan (2014) showed increased preference for print media with age, especially among men. Preference for internet interventions was highest in rural dwellers, women, those aged 35-44, and previous internet users. In a sample of urban Americans, Kim, Choo, and Ranney (2014) also showed a preference for technology-based interventions among women and a negative association with age, even though their participants' average age was only in the 40s, suggesting more of a concern in older people. Few studies have addressed people older than 50, leaving a large knowledge gap. Also, women appear to be more willing users of the internet and more enthusiastic seekers health-related information. Even when they might be effective, there is limited evidence of good uptake of internet or device based interventions in patient groups. For example, Crutzen, Ruiter, and de Vries (2014), in a sample of Dutch adults already participating on an internet research panel, showed little improvement in uptake of information from web-sites compared to paper sources. However, the information presented (about Hepatitis) was not necessarily salient to their sample. Results might be different when patients already receiving treatment for a chronic condition are offered internet or device based support relevant to that condition.

Few studies have addressed provision of health-

Table 1

Multiple Regression Models of Electronic Device Use Cognitions Predicting Interest for Using Electronic Devices (ED)

		Dependent Variables			
		Interest in ED to manage health[1]	Interest in ED to find health information[2]	Interest in ED to increase PA[3]	Interest in ED to take medications[4]
		M = 3.26, SD = 1.48	M = 3.88, SD = 1.31	M = 3.39, SD = 1.36	M = 2.95, SD = 1.40
		R^2_{adj} = .48, p < .0001	R^2_{adj} =.313, p < .0001	R^2_{adj} =.415, p < .0001	R^2_{adj}=.236, p < .001
Predictors	Mean (SD)	β (standardized)	β (standardized)	β (standardized)	β (standardized)
Electronic Device (ED) Use Cognitions					
Subjective norms	5.27 (1.56)	.173	-.052	.121	-.040
Descriptive norms	4.80 (1.52)	-.087	.011	.263	.263*
Instrumental attitude ED to manage health	5.06 (1.39)[+]	.471	.362		.312
Affective attitude ED to manage health	4.62 (1.37)[+]	-.142	-.127		.022
Internet confidence	3.26 (1.11)	.320***	.454**	.299*	.189
Instrumental attitude ED to exercise	4.90 (1.35)[++]			.477	
Affective attitude ED to exercise	4.48 (1.45)[++]			-.092	

Note. Dependent variables and Internet confidence scales = (0-5), all other measurement scales = (0-7); ED = electronic device, PA = physical activity; ǂp < .10, *p < .05, **p < .01, ***p < .001; [1] $F(5,60) = 13.16$, p < .0001, [2] $F(5,60) = 6.91$, p < .0001, [3] $F(5,60) = 10.21$, p < .0001, [4] $F(5,60) = 4.025$, p < .001, [+]Significantly different from each other, Eta^2 = .31, p <.0001; [++] Significantly different from each other Eta^2 = .293, p <.0001.

related information subsequent to an intensive training/rehabilitation program when, arguably, less information seeking is needed compared to confirmation and reminders of appropriate self-care. Additionally, few studies have addressed the idea that internet/device use itself is a behaviour that must be learned and incorporated into daily life to be effective. There is, however, evidence that reminders delivered by mobile phone can improve medication adherence, achievement of daily step targets, and support smoking cessation attempts, all of which seem relevant to the post-rehabilitation goals of COPD patients. Therefore, internet or mobile phone based behaviour maintenance interventions might be useful to this group.

Social cognitive theories posit a number of pre-requisite cognitions to support the initiation and

maintenance of behaviour. Bandura (1997) suggests that for self-efficacy to predict behaviours, the necessary skills and incentives must already be in place. It is possible that the effectiveness of internet or smartphone delivered interventions/messages is impaired by the lack of these pre-requisite skills and abilities for using the medium itself. We conducted a small survey to explore this possibility.

We recruited 75 patients from a PR program (mean age 68.70 years; n = 36 men; n = 37 women), with a smoking history of 36.47 pack years (i.e., smoked one pack per day for 36 years), and a one second forced expiratory volume (FEV1) of 63.14% of predicted. Using a paper and pencil survey, we assessed variables including what devices they owned (desktop computer, laptop computer, cell phone, smart phone, tablet, email address), how frequently they used devices for email, text messages, apps; and interest for using devices to manage health. We also assessed instrumental (function) and affective (preference) attitudes, subjective (i.e., social pressure) and descriptive norms (perceptions similar others' behavior) for using devices to manage health and physical activity. These were assessed on 7-point scales according to basic tenets of social-cognitive theories, particularly the theory of planned behaviour, and standards of assessment recommended by Godin and colleagues (e.g., Godin et al., 2010). We assessed 'internet confidence' on 5-point scales using nine items that assessed confidence for things like using email, understanding terms like 'modem', loading web pages, and using online discussion groups (Eastin & LaRose, 2000). We assessed their preferred device to receive health and exercise information and their interest in receiving health and exercise advice via social network sites. We were interested in absolute scores for internet and device usage and the relative influence of the social cognitions for internet and device use on their interest in using devices for managing health, finding health information, increasing physical activity, and taking medications.

Of 73 patients providing responses, 12 had no desktop or laptop computer, while the rest had either one or both. Fifty (68%) had a cell phone of which 20 (27%) were smart phones, 34% had a tablet, and 72% (n = 53) had an email account. The frequency of device use among those who had them was between never and daily. About 50% used a computer at least once per week, but sent or received texts less than once a month; 61% used apps once a month or less. These data suggest COPD patients are low, but nonetheless users, of email and the internet. Asked their most preferred device to receive health-management information, only 23% did not want to receive information on a device; 51% preferred a computer; the remainder preferred an app or text message. On a 5-point scale, mean interest in using devices to manage health, find health information, increase physical activity, and help take medications was moderate, suggesting willingness. Regressions were conducted to examine the influences on interest in using devices to support health behavior. All descriptive statistics and analytical results are reported in Table 1.

Generally, the differential associations of the predictors with interest in using devices to support each of the target behaviours (e.g., increasing physical activity or taking medications) support the proposition that device usage is distinct from the target behaviours. Internet confidence was an important predictor of interest in device use for all behaviours but taking medications. Descriptive norms were an important predictor of interest in using devices to support taking medication, but no other target behaviour. Thus, descriptive norms (what similar others are perceived to do) seems to be related to taking medications. This might be because this behavior is more normatively contextualized than general health management or physical activity. Medication use reminders are a strong candidate for device based intervention. Instrumental attitudes were significantly stronger than affective attitudes for using devices for managing health and increasing physical activity, suggesting patients see the usefulness of devices more strongly than they like

using them. The overall means for the attitudinal variables were well above the scale mid-point, suggesting openness to the behaviours. Training and experience with devices might develop a preference for using them. Confidence, however, hovered near the mid-point of the scale, suggesting this might be a good place to start to assist patients to make effective use of potentially strong supports for health behavior change maintenance. It is clear that device use behavior is distinct from the health behaviours it is intended to support, and appropriate training and motivation is necessary for implementing both the medium and the message.

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