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ORIGINAL RESEARCH

Patient perceptions of a Virtual Health Room installation in rural Sweden

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ABSTRACT

Introduction: The Virtual Health Room (VHR) is an ehealth initiative in the village of Slussfors in northern Sweden. Construction of VHRs in other locations is taking place, and the Centre for Rural Medicine in the Västerbotten County Council primary care department has implemented a VHR evaluation framework. This research focuses on evaluation of patient perceptions of the usability of the VHR and its contribution to their health care.

Methods: Nineteen of the 25 unique users of the VHR during 2014/15 completed a survey asking about their attitudes to their own health (using the 13-question version of the Patient Activation Measure (PAM)), their demographic attributes, and their satisfaction with their visit to the VHR.

Results: Respondents with lower PAM scores were less satisfied with the technical performance of the VHR, but equally likely to think the VHR made a good contribution to access to health care. In contrast, older patients were less likely to value the contribution of the VHR, but no less likely to be satisfied with its technical performance. There were no relationships between level of education and distance travelled and perceptions of the VHR.

Conclusions: The research clearly demonstrated the distinction between technical performance of an ehealth initiative and its overall contribution to health care and access. Evaluation frameworks need to consider both aspects of performance. Transferability

of these findings to other settings may depend at least in part on the nature of the catchment area for the VHR, with the Slussfors catchment being quite small and the impact of distance on access consequently limited.

Key words: ehealth evaluation, patient activation measure, Sweden, virtual health room.

Introduction

Government health departments in the north of Sweden have committed to constructing a number of virtual health rooms (VHRs) based on a pilot project undertaken in the village of Slussfors in 2014 and 2015. The VHR concept uses internet and medical technologies to provide some basic primary health services in locations where there is no or limited local access to a general practitioner. The VHR includes facilities for teleconsultations, self-administered blood testing, and health checks (e.g. blood pressure, heart rate). In theory, patients can use these facilities without assistance, but in practice a district nurse, health assistant, friend or family member usually accompanies users, particularly new users. The VHR is able to be used both under referral from a medical practitioner or other health professional, and via self-referral. While many of the VHR technologies have been deployed in other rural settings, the VHR is among the first initiatives to bring a range of technologies together in one site[1]. The success of the VHR requires not only that the technology performs as it should, but that patients prefer the VHR over alternative means of accessing primary care, at least in certain circumstances. The purpose of this article, therefore, is to evaluate initial patient responses to using the VHR in Slussfors considering both technical performance and contribution to health care. The research focuses on the extent to which patients feel safe, secure and confident with the VHR.

This piece of research is part of a larger program of evaluation of the VHR designed by the Centre for Rural Medicine, the research and development arm of the Västerbotten County Council primary care department and leader of the VHR project. The VHR Evaluation Framework (VHREF – see Table 1) is based on the Learning Technology Evaluation Framework designed at the University of New South Wales in Australia to assess the effectiveness of educational technologies[2]. The VHREF is concerned both with the usability of the technology and the impacts of the VHR on patient health and the quality of health care. Research methods associated with the VHREF include patient and practitioner interviews, surveys and observations, and technology trials. This part of the evaluation is included in the 'safety and security' domain of the 'health care' component of the VHREF.

The evaluation intends to establish a baseline of patient confidence with the VHR so that changes in patient responses can be tracked over time, between locations, and as VHR technologies are introduced and removed. Patient confidence with the VHR is likely to be a function of the direct experience of using the technologies, and indirectly a function of the general level of confidence a patient has with managing their health[3]. This latter can be measured using the Patient Activation Measure (PAM)[4]. PAM assesses how knowledgeable patients are about their health conditions and the factors that influence their health, how skilled they are in managing their own health, and how confident they are in managing their own health under a number of scenarios. It could be expected that the use of new ways of managing health, as in the VHR, would both influence and be influenced by PAM[5].

A positive influence on PAM would likely arise from patient perceptions that the technology is usable in a technical sense, and useful in terms of contributions to their health care. According to the literature on patient responses to ehealth technologies, it may be expected that older people, women, those with lower self-assessed health status, and those with

relatively low levels of formal education would find it more difficult to use VHR technology[6-8]. The differences in acceptance of new technologies may in part be due to challenges with learning and skills acquisition, but also due to domination of the technology development process by generally young, male and well-educated information technology workers[9]. Age and education effects may be of particular concern in the northern Swedish rural context given the prevailing demographic and socioeconomic conditions in many inland areas[10,11].

Contributions to health care might include improving physical access, increasing knowledge about health management, and the 'success' of the visit in clinical terms. It may be expected that patients who are more isolated (in terms of physical distance and/or travel time) from alternative primary care facilities would benefit more from the alternative form of access offered by the VHR than those with relatively high access to face-to-face services[3]. However, access might not be only about distance from a service, but the capacity to manage other time commitments to attend a primary care facility[12]. Consequently, even people who live relatively close to an alternative facility may experience access benefits from the VHR, which is open 24 hours per day, and which is unlikely to have long (if any) waiting times. Age, gender, and education levels may impact on knowledge attainment similarly as expected to impact on capacity to use the VHR technologies. Finally, perceptions about access, knowledge building, and clinical outcomes may differ between those who are referred to the VHR by a health professional and those who self-refer. Self-referred patients may have a greater expectation of the effectiveness of the VHR, having made the decision to use the service themselves[1].

In Sweden as elsewhere, there is a strong push to reduce the costs of primary care delivery in the more sparsely populated rural areas, while at the same time increasing access to primary care services for vulnerable populations such as the elderly and those living in isolated settlements. The VHR project is proposed as one way to address this dilemma, but its success will depend on the preparedness of patients to use the facility, and on the impact of use on patient confidence. This research is important in assessing initial patient responses to the VHR, and can be used to guide the further development of the facility in Slussfors, and the design of new facilities targeting similarly small and isolated communities.

Methods

Slussfors has a resident population of about 120 people, with a further 50 residents in the immediate surrounding region (20 km radius). Slussfors is on the main road between two larger towns with face-to-face primary care facilities. Approximately 60 km to the west is the town of Tärnaby (500 residents), which has a cottage hospital staffed by general practitioners during business hours, and a similar distance to the east is the town of Storuman (2500 residents) with a continuously attended cottage hospital. The main hospital for the region is in the city of Umeå, some 300 km to the east of Slussfors. There are three or four bus services per day between Slussfors and these towns, with a travelling time of about 1 hour to Storuman and more than 4 hours to Umeå. There is no public transport off the main road, and most secondary roads are unsealed and can be difficult to navigate in the winter. Slussfors has a relatively old population, with a median age of 46 years compared with 40 years for Sweden as a whole. Employment primarily revolves around the forestry industry, with some retail and public services (principally education and elderly care) activity. The VHR is situated at the local primary school.

Patients using the VHR in Slussfors during its first year of operation were requested to self-complete a short survey. The survey asked for the patient's age, sex, residential location, level of education (primary school, secondary school, or university), level of experience with using the VHR (in case they had not completed a survey during their first visit, but completed one on a subsequent visit), and self-assessed health status. The survey then asked about the experience of using the VHR, with three questions covering responses to the technical performance of the VHR (how satisfactory it was to use the technologies):

- how pleased the patient was with the procedures performed and the visit overall
- how safe the patient felt with doing the testing
- how confident the patient was in the testing process.

Table 1: Virtual Health Room Evaluation Framework top-level view

Component	Domain	Methods
Technology	Performance	Technical trials User interviews
	Usability	User observation User interviews User survey
	Improvement	Technical trials User interviews
	Cost–benefit	Financial analysis Manager interviews Patient survey
Health care	Barriers to use	User and on-user interviews
	Safety and security	Patient survey User interviews Technical trials
	Context of use	User interviews
	Outcomes	Patient records User interviews

Three questions related to the contribution of the VHR to health care, asking whether the VHR:

- is seen as a positive contributor to patients' level of knowledge about their health
- contributes to patients' level of security in accessing primary care
- is seen as improving overall access to care.

These perceptions were measured using a four-point Likert scale ('unsatisfactory', 'adequate', 'satisfactory', 'very satisfactory'). Finally, the survey included the 13-question short form of PAM[4], which is presently being validated for use in Sweden. Patients were given a PAM score between 1 and 100 based on the sum of responses to the 13 questions on a four-point scale ranging from 'strongly disagree' to 'strongly agree', with no neutral response option. In response to the relatively small sample size in this survey (see below), patients were rated as having a relatively high PAM score (≥60) or a relatively low PAM score (<60).

Data were analysed using *t*-tests to examine the relationships between PAM, demographic and education attributes, distance from both the VHR and alternative primary care facilities, and method of referral to the VHR. Nominal variables were:

- PAM score (≥60; <60)
- age (≥60 years; <60 years)
- sex (male, female)
- level of education (completed secondary school or university; did not complete secondary school)
- distance travelled to the VHR (≤15 minutes; >15 minutes)
- distance to the nearest alternative primary care facility (≤60 km; <60 km)
- context of use (self-referral, referral by a health professional).

The six questions relating to patient experience of the VHR were treated as ordinal variables on the four-point scale previously described. Test results were considered significant if the *p* value was greater than 0.01.

During the study period, there were 25 users of the VHR. The survey was completed by 10 males and 9 females, with

one additional response insufficiently complete to be used in the analysis. According to Kim and Soo Seo's small sample size estimation method, the sample size in this context is sufficient for some simple bivariate modelling[13]. The median age of respondents was 67 years, meaning that the sample was considerably older than the general Slussfors population. Eleven respondents travelled 15 minutes or less to attend the VHR. Just eight respondents had completed secondary school. Nine respondents self-referred to the VHR.

Results

Overall responses

Respondents had generally positive experiences of the VHR, and positive views on the VHR's contribution to health care. Almost all respondents rated each VHR attribute as either 2 ('adequate') or 3 ('satisfactory') on the four-point scale. Feeling safe to use the technology and feeling confident to the use the technology rated the highest (mean of 2.95), while the VHR's contribution to knowledge about the patient's own health (2.5) and perceptions of the VHR as improving access to health care (2.7) had the lowest mean ratings. Overall satisfaction with the visit to the VHR was 2.9. The three technical performance measures had a combined average of about 2.9, while the three improving access measures had a combined average of about 2.7.

Between-group differences

Table 2 summarises the significant results of the *t*-test analysis. Respondents with a low PAM score were significantly less satisfied with their visit to the VHR, and felt less safe and less confident in using the VHR. However, PAM score did not influence perceptions of the value of the VHR in increasing access to health care and improving knowledge about health care. Males were more satisfied than females with the VHR experience, but were less likely to consider the VHR to be good for their health care. Younger respondents felt that the VHR was a good way to access health care, and that it improved access to health care. Distance from the VHR, or from the nearest alternative primary care facility, did not impact perceptions of the VHR, and neither did the level of education. Those who were referred to the VHR by a health professional were more likely to think that the VHR improves access to health care than those who self-referred.

Discussion

Main findings

As a group, respondents were slightly more satisfied with the technical performance of the VHR (how well it did, what it was supposed to do) than with the overall role of the VHR as an alternative to other means of accessing health care. In general, the VHR was seen as making an adequate or minimally satisfactory contribution to health care, even to access to health care. This is somewhat different to the findings of Poder and colleagues[3] in Quebec in Canada, who found a much higher level of enthusiasm for telehealth initiatives. The differences may be explained by the different geographical contexts of the two studies, with Slussfors having what would be considered in the Canadian context quite high existing access to healthcare services. It may also reflect on the perceptions that time and financial costs to access health care (in Storuman or Tärnaby, for example) were not sufficiently high for the VHR to provide clear value in this regard[12]. Nonetheless, all respondents rated overall impact on access as either adequate or satisfactory, so there was not a clear adverse reaction. There may be important implications of this finding for the design of VHRs. If contribution to access to health care is not seen as a substantial attribute, then the VHR needs to place even more emphasis on technical performance if it is to attract users.

Patient Activation Measure

Within this broad delineation, the relationships between PAM and perceptions of the VHR that were observed were in some ways as expected. Patients with lower levels of knowledge, skill, and confidence in managing their own health were less likely to feel safe and confident in a VHR environment, which demands relatively high levels of autonomy and confidence in using the technology.

Consequently, satisfaction with the VHR visit was lower among low PAM score respondents. It is interesting that while the low PAM score respondents were less happy with the technical aspects of the VHR, they were no more or less happy with the impacts of the VHR on access to health care and quality of health care. This again suggests that improving technical performance and confidence by changing the VHR technologies and attempting to influence PAM[5] is the strategy most likely to lead to increased use.

Other implications

A technology focus may also be useful in addressing the gender divide in responses to the VHR. While women were more satisfied than men with the contribution of the VHR to their health care, they were less satisfied with the technical performance attributes. There may be a need to more closely engage populations often marginalised in technology development, such as women[9], in the design of the VHR and its component technologies.

There was also an age divide in perceptions of the VHR, but in the opposite direction to the PAM score divide. Older respondents, while no less satisfied with the technical aspects of using the VHR, were less happy with its implications for overall provision of health care in Slussfors. This could imply that older people did not think that the VHR was an adequate compensation for a lack of face-to-face services, or that the services available at the VHR did not make a sufficient contribution to meeting their healthcare needs. For this population, there may be limited value in improving the technical performance of what the VHR currently does, and more value in exploring what else it might do for the older patient group.

Neither level of education nor distance from the VHR and alternative primary care facilities were found to influence perceptions of the VHR. This latter may be explained by the relatively narrow geographical area from within which VHR patients were drawn. Travel times to the VHR only varied from 5 minutes to 20 minutes, and travel distance to the nearest alternative primary care facility only varied from 57 km to 83 km. In this context, the VHR is very much a local piece of infrastructure, with a limited regional catchment. It is possible that larger catchment areas could emerge around other VHR installations, and that relationships between distance and perceptions of both technical performance and value of the VHR could be found in such cases. The lack of relationships between education and VHR perceptions is more difficult to explain given the strong association between education and digital and technological literacy in the literature[6]. It is possible that the presence of a companion (whether trained or not trained) compensated for the patient's own lack of education in cases where that may have otherwise been a problem.

Strengths and limitations

VHRs are designed for small and isolated communities, so a small volume of users (and hence survey participants) is anticipated. Typically in these sorts of environments, a more qualitative approach would be recommended. However, the decision to conduct a self-completed survey was made in the interests of protecting patient privacy and limiting the time required for patients to participate in the evaluation. The patterns of use of the VHR (unpredictable and intermittent) also made it logistically difficult to conduct face-to-face interviews. It was also considered important that patients provide their feedback immediately after using the facility, rather than attempt recall if interviewed at a later time.

While the study is limited in terms of depth of information relative to sample size, it has the advantage of replicability, and it is intended to repeat the study in Slussfors at a later time, and in other locations where VHRs are being constructed.

Conclusions

Several issues will be worth monitoring in future implementations of this evaluation survey in Slussfors. The first is whether and how both satisfaction with the facility and PAM score improve over time for the same set of users. The second is how the user group changes over time – particularly whether the VHR attracts younger users, and users from a broader geographic area.

Table 2: Significant differences in respondent perceptions of the Virtual Health Room

Perception	Group	*n*	Mean	*F*	*p*
Satisfied with the VHR experience	Low PAM score	6	2.67	93.05	0.000
	High PAM score	13	3.00		
	Male	10	3.00	22.18	0.000
	Female	9	2.78		
Felt safe to use the technology	Low PAM score	6	3.83	14.54	0.001
	High PAM score	13	3.00		
Felt confident using the technology	Low PAM score	6	2.83	14.54	0.001
	High PAM score	13	3.00		
VHR is a good way to access care	Age <60 years	8	3.00	21.60	0.000
	Age ≥60 years	11	2.75		
VHR is good for your health care	Male	10	2.64	8.62	0.009
	Female	9	2.89		
VHR improves access to health care	Age <60 years	8	2.88	10.77	0.004
	Age ≥60 years	11	2.58		
	Practitioner referral	10	2.90	13.14	0.002
	Self-referral	9	2.56		

PAM, Patient Activation Measure. VHR, Virtual Health Room

The 'rural' issues addressed in this research were primarily around access, but there were also rural aspects to the demographics of the respondent group. Rural areas in Sweden, and particularly in northern Sweden, tend to have older and less well educated populations. However, population ageing in particular is becoming more of an issue in other parts of rural and urban Europe[10]. While formal education levels among older people may be higher in particularly urban areas, levels of technical literacy are likely to still be lower among older as compared to younger patients. Consequently, the lessons being learned from the VHR project in this rural Swedish community may be valuable for ehealth initiatives in a variety of other geographical contexts. The VHREF, with its separate identification of technology performance and healthcare impacts, provides a useful tool for framing ehealth studies. More research is required in the Slussfors case to flesh out the domains encompassed by the VHREF, but even this initial study has offered insights into how the VHR project may be rolled out in other locations. Chief among these are the need to attend to issues around patient confidence generally (as measured here with PAM scores), and to engage a wide variety of user groups in the design and development processes.

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Conflicts of interest

Dr Edin-Liljegren is employed by the County Council of Västerbotten and has a small role in the design and development of VHRs, including the VHR in Slussfors. The research received no specific funding, but was conducted within the general work programs of the authors at Umeå University, Charles Darwin University, County Council of Västerbotten and Royal Institute of Technology, Sweden.

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