

EVALUATION OF PRACTICAL FEASIBILITY AND ACCEPTABILITY OF HOME MONITORING IN A RESIDENTIAL HOME SETTING

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Abstract: This paper discusses the feasibility and acceptability of remote vital signs monitoring in three UK residential nursing homes. To date, a total of 30 patients with a variety of chronic conditions have been regularly monitored. There have been three acute episodes of care. The study demonstrated the following results. The monitoring equipment chosen largely met the users' needs. Data transmission was found to be unreliable on occasions, and consequently was improved by extending the wireless network in the homes. Data access and presentation were considered acceptable, although suggestions for minor changes were made. Interviewees saw several potential benefits, such as better patient care and a reduction in hospital admissions. Patient acceptance was very good. Time-commitment required for the monitoring was rated, on average as manageable. Overall, feasibility appears to have been largely proven, and the system was reasonably well accepted by all.

Introduction

An increase in the proportion of elderly people in society, many of whom suffer from chronic diseases, is requiring a growing share of worldwide healthcare budgets. Remote patient monitoring (RPM), which uses information and communication technologies (ICT) to provide vital signs monitoring at a distance, can facilitate the efficient and effective use of healthcare resources, and can help to provide convenient and high quality care to patients. Hospitalisations can be identified by the early detection of deteriorations. This can both reduce the number of unnecessary admissions and enable prompt emergency responses. RPM also enables the early discharge of patients from hospital by providing hospital monitoring in the home [1].

Currently, most monitoring takes place in patients' own homes (home monitoring). As part of the EU-funded e-Vital project, we have established a monitoring service in three community care homes (two residential homes and one nursing home) and investigated its use in this environment. Community care homes have a large proportion of dependent and semi-dependent residents who often suffer from multiple chronic diseases and frequently require medical attention. Residential care homes are staffed with carers

and do not have any medical staff on site, while nursing homes have at least one nurse on duty around the clock. Most residents of a community care home are registered with the same General Practitioner (GP), and remote patient monitoring has the potential to reduce the need for GP visits to the home since they can assess their patients remotely. It can also give the home more autonomy and enable them to provide better care for their residents, since they have better access to external medical expertise.

Methodology

Three residential homes to the northwest of London, with their associated medical centres, participated in the UK pilot of the e-Vital project and have been equipped with telemonitors (RGB Medical Devices, S.A). The telemonitors are able to measure several parameters including 7-lead ECG, blood pressure, oxygen saturation (SpO₂), heart rate, temperature and respiration. They can be operated in a non-clinical environment by non-medical personnel. When the data has been recorded, it is transmitted over the Internet to the RGB data server. Health professionals have access to the data via a secure website.

The aim of the first phase of this study was to determine practical feasibility and acceptability of the monitoring. Evaluation was based on a qualitative approach and involved semi-structured one-to-one interviews with key members of staff from the residential homes and medical centres (two doctors, four managers, one carer and one nurse). The first set of interviews was conducted in September 2003, and was followed up in July 2004. Patients could not be interviewed for ethical reasons. The aim of the interviews was to investigate the number of residents, the conditions, and the advantages and disadvantages the interviewees saw in the monitoring. In addition, the interviews sought to determine whether they wanted to continue the monitoring after the end of the project (July 2004 only), and, if yes, what additional features and changes they would like.

Figure 1 demonstrates the generic network architecture for each home. The telemonitor is connected wirelessly (802.11 b/g) to an ADSL router, and the data is uploaded to the server over the public Internet through the secure Point-to-Point-Tunneling

Protocol (PPTP). The data can be viewed by medical staff at the associated surgery or local hospital through their connection to NHSNet, the regional health network of the UK. This is a private managed network with no external access, and so it was necessary to place the server outside of NHSNet, because the firewall would have blocked the incoming traffic from the telemonitor.

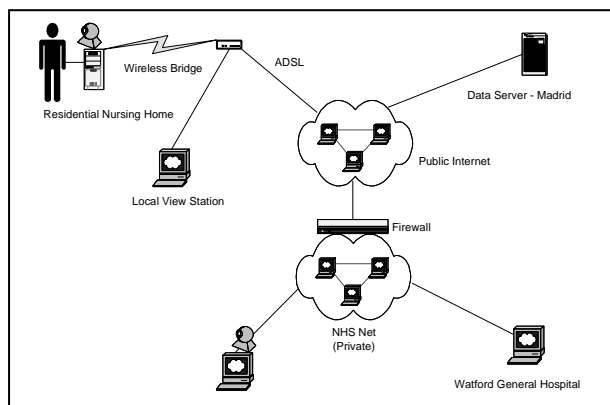


Figure 1: Network architecture in pilot sites

Evaluation

We used a qualitative evaluation in order to assess how successful the monitoring was in each home. The evaluation was based on semi-structured interviews with key members of staff (two doctors, four managers, one carer, one nurse and the technical director). Patients could not be interviewed for ethical reasons. For this purpose, the relevant literature was searched for factors indicate success in projects, and how projects should be evaluated. These criteria were then applied to the three homes.

Results

Evaluation – findings from the literature

It has been suggested that the evaluation of telehealth projects is highly complex. Research teams tend to underestimate the technical and organisational complexity of the task, which leads to problems selecting and implementing equipment, and difficulties in interpreting the data collected (May *et al.*, 2002). Wootton and Hebert (2001) state that before evaluating a telehealth project, an understanding of what constitutes success is necessary. Table 1 shows evaluation criteria adapted from the authors. It is emphasised however, that telehealth projects must be considered in relative, not absolute terms, i.e. “success cannot be judged in isolation” (p.6). This means that success depends on the perspective and on the available alternatives. If no other healthcare is available for instance, telehealth will always be preferable, even if it is clinically inferior to conventional healthcare. Success can also depend on the perspective adopted, such as that of the clinician, the patient, the healthcare provider, society as a whole, etc. Consequently, there is “no

single criterion for success”, but the most relevant criteria should be applied (ibid). As an overall guideline, Hailey (2001) suggest that success in telehealth can be measured in the extent to which it has contributed to the provision and maintenance of a health service.

Table 1: Indicators of success for telehealth projects (adapted from Wootton & Hebert, 2001)

Indicator
Routine operation
High activity levels
Clinical efficacy
Cost-effectiveness
Adequate financing (no special funding arrangements required)
Acceptance by clinicians
Acceptance by patients
Improved access to healthcare
Reduction of travel

Evaluation - findings from the interviews

30 residents were monitored by the three homes and their associated medical centres between July 2003 and September 2005 most of them on a number of occasions throughout the duration of the project. The residents were monitored for respiratory disorders, cardiac problems, high blood pressure, diabetes and renal problems. Most commonly, the monitoring was used to investigate residents who were unwell, and in most cases the outcome was that no immediate action was required. However, in these cases it did help the staff to determine whether and how urgently a resident needed to be seen by a doctor.

In three cases, however, the monitoring led to a significant cardiac event being discovered and responded to promptly: two asymptomatic myocardial infarctions and one pericardial effusion. Without the availability of the telemonitor, these events might well have remained undiagnosed until much later. However, response time is critical for the survival and later well-being of the patient.

The interviewees were asked to rate the ease of use of the equipment, and overall found it ‘easy’ to use.

The ICT system performed well, although on a number of occasions, data transmission was not possible because the server was not available, which was frustrating for the staff. For the same reason, access to the data via the secure website was not possible at times. It was stated that the monitoring was accepted very well by patients and their families.

The benefits of the monitoring were mainly associated with clinical issues, such as potential better health outcomes for patients. The key advantages that were mentioned were better communication with the GP, and the potential to detect deteriorations early. The disadvantages were primarily of a technical nature, such

as the server being unavailable at times, and the website not being very user-friendly.

Comparison of sites

The key difference between the nursing home and the two residential homes was that the nursing home is staffed by nurses around the clock. For the monitoring service this meant that any data generated by the telemonitor could be interpreted locally to some extent (apart from ECG recordings). The residential homes did not have such expertise, which initially was not anticipated to be a problem. However, we found that in an environment without medical skills the staff do not have sufficient knowledge to decide when a resident might benefit from being monitored and being assessed remotely by their GP. A nursing home proved to be a better setting, since sufficient knowledge existed locally, while the staff were still able to take advantage of the GP at the surgery.

The level of care a home provides is also reflected in the licence it holds, which determines what procedures can be carried out. So was one of the residential homes temporarily stopped from using the monitor, since the inspectors deemed it inappropriate to generate data that could not be responded to by the staff of the home. This was later resolved, since the purpose of the monitoring was to count on external expertise.

The nursing home has a relatively dependent population, which is either disabled or elderly and very fragile. Approximately two thirds of the monitoring was carried out in this home, since the need for such a service was greater than in the residential homes, whose residents are relatively well.

The home in which the telemonitor was used the least, suffered from a high staff turnover, and at times staff shortage. When the manager, who was responsible for the project, left, the monitoring was abandoned. In the two other homes, however, there was a good stability of staff.

Another key characteristic of the nursing home was that it had a dedicated clinical champion. This nurse promoted the use of the telemonitor, and other staff became involved. This meant that in the absence of the champion, the equipment could still be used when necessary.

Discussion

Remote patient monitoring in community care home has been investigated very little so far. It is however a good setting for RPM, since the equipment can be shared among many patients, and staff are at hand to assist with the monitoring.

Despite the good acceptance of the monitoring, use in the residential homes remained relatively low. It can be assumed that there are benefits of providing such services, although so far we have not been able to discover them. In the nursing home, the higher occurrence of medical emergencies made the service more beneficial. However, the staff may also have been able to utilize the monitor better since their medical

knowledge allowed them to determine better when it could be beneficial to investigate a patient. Out of the nine indicators of success identified from the literature, four (clinical efficacy, acceptance by clinicians, acceptance by patients and improved access to healthcare) were met, at least to some extent. In the least successful home the only indicator that was met was good acceptance by patients.

However, the monitoring in all three homes did not become clinically and organizationally sufficiently integrated to be used routinely and to become a sustainable service. In a large part, this can be attributed to the technical problems that were experienced, however, in the two residential homes the demand for the monitoring was perhaps not high enough to justify its continuation. It can also be argued that due to the equipment not always being reliable, and the website not being user-friendly, the full potential of RPM in this setting could not be determined.

Lessons learnt

A number of lessons were learnt from the project. The main one is probably that telemonitoring is most beneficial where a sufficient need exists for such a service, i.e. a relatively dependent population.

Purchasing a service rather than renting it on a daily or monthly basis gives control to the healthcare provider rather than the equipment manufacturer. Frequent downtime of the server meant that the telemonitors often could not be used when required, which decreased trust in the equipment and demoralized staff. Although it was understood that the project was at the experimental stage, such unreliable performance is not acceptable in a clinical or care environment.

Conclusions

From the comparison of the three sites, it appears that a certain level of medical skills, such as available in a nursing home, allows the best utilization of remote patient monitoring. Nurses appeared better able to determine when a patient might benefit from being monitored and assessed remotely by their GP than carers, who did not always have the necessary skills to make such an assessment. The service also seemed to be used most effectively where a higher need existed, i.e. in the high dependency population of the nursing home rather than the relatively well residents of the two residential care homes. .

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References

- [1] BRATAN T., JONES R., CLARKE M. (2004): "A new monitoring service for long term residential care", *Studies in Health Technology & Informatics*, **103**, pp.374-80.

- [2] MAY C.R., WILLIAMS T.L., MAIR F.S., MORT M.M., SHAW N.T., GASK L. (2002): “Factors influencing the evaluation of telehealth interventions: preliminary results from a qualitative study of evaluation projects in the UK”, *J of Telemed and Telecare*. **8:S2**, pp65-67.
- [3] WOOTTON R., HEBERT M.A. (2001): “What constitutes success in telehealth?”, *J of Telemed and Telecare*. **7:S2**, pp3-7.
- [4] HAILEY D. (2001): “Some successes and limitations with telehealth in Canada”, *J of Telemed and Telecare*. **7:S2**, pp73-5.