electronic Journal of Health Informatics
http://www.ejhi.net
2009; Vol 4(1): e1

Videophone delivery of Medication Management in Community Nursing

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Abstract
Innovative methods are needed to deliver nursing care for an increasing number of people with chronic conditions who require assistance to stay in their own homes. The purpose of this pilot study was to assess the practicality, suitability, safety and costs of delivering daily home medication management by videophone. Elderly clients with cognitive impairment, and clients receiving Directly Observed Therapy (DOT) for tuberculosis were recruited, and over a period of 6 months, 9 clients had broadband and IP Videophones installed in their homes. Nursing protocols and a backup system with the nursing field service were developed. Results showed that clients with mild to moderate cognitive impairment, multiple medical problems and who lived alone were able to use the service. The clients and Call Centre staff viewed the videophone service positively, medication management was delivered safely, and the service was time and cost-efficient compared to a home visit by a field nurse. The videophone service enabled increased continuity of delivery of medication management on weekends and public holidays, more flexibility of timing to suit the clients, and Call Centre staff were able to address other health issues through the videophone. To conclude, for selected clients, a medication management service delivered by videophone offers an effective alternative to the traditional drive-around visit. The videophone service has potential to be scaled up and to link to other health service providers.

Keywords: Telemedicine, home care services, medication therapy management, videoconferencing

1. Introduction

The purpose of this study was to assess the practicality, suitability, safety and cost-effectiveness of delivering medication management by videophone. This service was delivered by the Royal District Nursing Service of SA (RDNS SA), which is a non-government, not for profit organisation providing mobile nursing services and other home and community care in Adelaide, South Australia. The way in which the videophone service could either substitute, augment, or integrate with the traditional RDNS SA home visiting service was also considered. This is important because it is necessary to find ways to deliver nursing and other health services to an increasing number of people with chronic conditions requiring assistance to stay in their own homes, whilst making the most efficient and effective use of the health workforce.

In 2007, RDNS SA received funding from the South Australian Department of Health to conduct a pilot project of delivering services by videophone. Home installation of videophones has recently become possible and affordable in Australia for health care delivery due to the widespread availability of broadband connectivity, compression technology enabling good quality video over domestic grade broadband, the operational simplicity of videophones, which function in a similar fashion to a standard household telephone, and the technical development of a videophone exchange.

RDNS SA reviewed its range of services, and selected medication management to be delivered by videophone, because there is no hands-on component, and many cli-

ents require daily assistance for several months to years. The majority of clients referred are elderly, with multiple medical problems and cognitive impairment. A smaller number of medication management clients are enrolled in Directly Observed Therapy (DOT) for tuberculosis.

In the literature, there have been promising but small scale reports about home based video delivery of health care to the elderly with chronic disease, also known as "virtual visits", although none of the studies have been for daily medication management. Patients have reported consistently positive views of videophone consultations[1]; in some cases, more positive than the healthcare providers[2]. Many of the important aspects of home care delivery can be achieved by virtual visit, including assessment of clinical status, education, promoting compliance and addressing psychosocial issues[3]. It has also been shown that cognitively impaired elderly patients can effectively communicate by videophone with family members and nursing staff[4]. Improved daily functioning of elderly clients using home videophones has been reported[5]. A combination of physiological monitoring and weekly videophone visits by a nurse was found to avoid hospital admission and nursing home placement in a small sample of elderly patients with mild cognitive impairment[6].

Much of the home telecare literature has focused on remote telemonitoring, but there has been one randomised controlled trial comparing home nursing visits, virtual visits, and virtual visits plus physiological monitoring which showed that virtual visits improved patient outcomes for the lowest cost, and adding physiological monitoring did not produce any additional improvement[7]. In the USA, there have been recent developments and marketing of internet connected equipment which houses the client's medication, automatically reminds the client to take it by an alarm, and then records removal of the medication. However, this cannot confirm that the client has actually taken the mediation, monitor their general condition, or provide social contact.

In regard to tuberculosis, treatment requires multiple medications to be taken for a minimum of several months, and patients need to complete the full course of treatment, both to ensure a cure, and to prevent antibiotic resistant strains of TB from becoming a public health risk. In South Australia, if the treating physician has concerns about patient reliability, then the patient can be required to be observed taking their tablets. Directly Observed Therapy has been shown to improve compliance and reduce relapse in individuals, and may also be a factor in reducing the overall incidence of TB[8]. One previous study in Washington State, USA, with 6 patients has found that videophone monitoring can be successfully used for DOT[9], although at that time their low bandwidth (28K) Modems made the video quality less than ideal. They reported the benefits of videophone delivery were shorter visits, greater flexibility of scheduling and saving time and money on travel. Despite the reported benefits, a PubMed and Citations search found no studies in the literature since then which utilised telemedicine for home observation of tuberculosis treatment

2. Methods

2.0.1. Nursing Service

The RDNS SA Call Centre defined client selection criteria, wrote nursing protocols for virtual visits and carried out an awareness campaign amongst the field nurses to refer potential subjects. Two groups of clients were recruited: those receiving DOT for tuberculosis and those for general medication management. The latter group lived alone, had mild to moderate cognitive impairment, needed ongoing assistance and supervision to take their medication, and did not require hands-on treatment.

Prospective clients were visited at home by the first and second authors, a general practitioner and registered nurse, to assess their suitability for the videophone service, in conjunction with their usual field nurse and a relative or carer where possible. Consent was obtained and a photograph of the client taken so the Call Centre could be certain of client identification. If the client had cognitive impairment, the field nurse attended the client's home to assist with the initial video calls. Each client had an individual care plan developed for their virtual visits, and field nurse back up if a virtual visit could not be conducted. In addition, each client's usual general practitioner was informed about the study and all agreed to their patient commencing the service.

The DOT clients received a virtual visit Monday to Friday and took their medication unsupervised on the weekends, which was the same level of supervision they would have received from a face to face service. The general medication management clients received virtual visits 7 days a week, either once or twice a day, depending upon their medication regimen, and all had their medication delivered in Webster packs. This group received a weekly face to face visit to physically check their new Webster packs.

For the evaluation of this service the clients were interviewed, via their videophones, and asked to rate satisfaction, ease of use, service quality and whether or not they wished to continue with the service, and asked for any additional comments. The four nurses who conducted the majority of the videocalls received semi-structured interviews, to elicit their experience of conducting the videophone service, and how it functioned alongside other RDNS SA operations. The Call Centre also kept clinical progress notes and activity records, which were utilised in conjunction with other RDNS SA operational records to provide data on the time taken and costs of virtual visits compared with face to face visits.

2.0.2. Videophone Service

The videophones utilised for the project were Grandstream GXV 3000, configured to connect to a custom-built videophone exchange. The exchange was run on three separately located servers at separate Internet Service Providers (ISPs), with each server connecting to one of the three separate lines on the videophone. This provided a main exchange and two independent backups.

A broadband connection was installed at each client's home, at ADSL 2+ speed where possible, or the fastest connection otherwise available. For best results, the standard aimed at was 512K upload and download speeds with minimum jitter, however the videophones were configured to deliver the service on slower speeds where this was necessary. Once this data connection was activated, the videophone and router were installed. The RDNS SA Call Centre had two videophones installed and trained eleven nurses in their use. A call log and fault record were kept, documenting the service delivery. All costs associated with the installation of the broadband connectivity and home videophones were paid for by RDNS SA.

3. Results

3.0.1. Recruitment

Fourteen clients were assessed and nine recruited into the trial. Of the five clients who were not entered into the trial, one refused consent, two were too physically unwell, one lived in an area without broadband access, and one did not have a landline connection. In regard to the clients entered into the study, two received DOT for tuberculosis, and seven received general medication management. This latter group ranged in age from 61 to 85 years. Six had been diagnosed with dementia and one with short term memory loss following a head injury. Of their other medical conditions, three clients had heart disease, two had hypertension, osteoporosis, depression and stroke, and one each had diabetes, connective tissue disease, Paget's disease, renal failure and a psychotic illness.

3.0.2. Service Activity

RDNS SA records showed that a total of 1077 virtual visits took place, with an average length of 9 minutes, compared to 19 minutes for an equivalent field visit (comprising 5 minutes travelling time and 14 minutes face to face time). The two DOT clients completed their service in 5 weeks and 11 weeks, whereas the medication management clients received an ongoing service ranging in duration from 13 to 18 weeks. The number of virtual visits completed in this group ranged from 89 to 173 per client. Cost comparisons showed that a virtual visit was 60% of the cost of a field visit. There were also savings on the use of personal protective equipment for a DOT client who was highly infectious at the commencement of the service. The break-even point per client was 6 months of service if all initial equipment costs were included, and 5 weeks of service if using existing equipment.

3.0.3. Client Interviews

Eight of the nine clients were interviewed, however one client's results were disregarded because she was unable to understand the questions. Of the remainder, five were very happy and three somewhat happy with the videophones. None were neutral or dissatisfied. All clients reported that the videophones were very easy to use. Six clients said they would very much like to continue the videophone service, one client was neutral, and one no longer medically required the service. One of the DOT clients was able to be called before work at 6.30am and appreciated this flexibility of timing.

3.0.4. Nurse Interviews

The semi-structured interviews with the four Call Centre nurses showed that the nurses were very positive about delivering virtual visits. Personal contact and continuity of care with clients were reported: "It's funny, I am getting a rapport with them exactly as if I was doing a home visit.", and "It makes me feel like a real nurse again." They also liked the flexibility of the service, whereby virtual visits could be delivered twice a day, or early in the morning, both of which were difficult to arrange with field nurses. "We were able to medicate them all Christmas Day, New Year's Day, Boxing Day, so we didn't have to re-jig on their schedules." The nurses reported that it was relatively common for clients to not answer the videophone initially, because they were in the shower, or at a distance from the phone. One of the DOT clients was often hard to locate "There is one client that is very challenging. … It is very suitable for her because she is moving around so much and it saves the round nurse chasing her down." There were also examples where the nurses were able to intervene early and coordinate care to prevent relapse:

"I rang her on Sunday morning and she looked unwell; reported being tight in the chest. She said she had been taking her puffer and it hadn't worked, and she had been coughing up sputum. I suggested a medical review but the patient said she was OK. I persuaded her to let me organise a locum. I rang back two hours later to see how she was getting on, and the locum had been and gave her a few tablets – prednisolone I think – and a script for some more, and I thought the local chemist usually delivers, but didn't on a Sunday and I rang them and this was the case. I then rang the client's son and left a message. The son rang back and picked up the meds. The result was that she was put on a sliding scale of prednisolone and she had a good outcome."

In regard to safety, there were no medication misadventures. There was one incident where a client who had just taken their morning medication started to take their evening med-

ication as well, but this was observed and prevented.

3.0.5. Videophone Service

The videophone exchange was available 100% of the time. There was one episode of ISP failure, hence one line was unavailable while the server was moved to a new location. This was fixed in under 24 hours, with the other two lines providing continuity of service during that time.

There were eleven instances of being unable to deliver virtual visits, when the backup system of a drive around visit was required. The most common problem was power failure, with two cases of clients unplugging the phone or router, one of power disconnected from the house, and one of storms over Adelaide producing widespread blackouts which disconnected two clients. There were four cases of router failure which required replacement, three for technical reasons and one because a client poured a glass of water over their router. In addition one videophone was reconfigured by a technologically semi-literate relative, and one client was disconnected because of failure to pay the audio phone bill. Most problems were fixed within 24 hours, but the disconnection took three weeks to resolve.

4. Discussion

This pilot project has demonstrated that videophones can be successfully, safely, and cost-effectively installed in clients' homes to provide daily medication management for a small number of suitably selected clients. Elderly clients who lived alone, were on multiple medications and had some cognitive impairment were able to use a videophone, however very frail and unwell clients who were physically unable to answer a phone, or clients with severe sensory impairment were not suitable for the service. An important factor in the implementation of the service was the development by RDNS SA of protocols to ensure that the virtual visits were part of an integrated system that came under the auspice of accepted nursing practice. RDNS SA worked closely with their field service for both referrals and face to face backup. Field backup is necessary because although the videophone exchange is very reliable, issues at the home can cause disruption to the virtual visits. For the longer term clients, it may be worthwhile to install an uninterruptible power supply and router mounted externally on the house.

Since the conclusion of the pilot project, RDNS SA has continued the videophone service for trial clients and indicated an intention to take on larger numbers of clients, which will provide more information about the generalisability of the service. As the larger costs were upfront, namely installing broadband and purchasing videophones, the cost-effectiveness increases with longer service delivery times. There is significant potential to grow such a service because the general medication management clients suffered from the common chronic conditions that are responsible for much of the burden of disease in our community, and their numbers will increase over time. The videophone service offers an efficient way to increase the amount of medication management delivered, and has also proved able to monitor and provide early intervention for other health problems. As well as providing medication management, there is the potential to add value to medication review, as problems or issues with medication will be directly observed and can then be communicated to the GP or pharmacist. Further research on client outcomes is planned. Videophones have also recently been installed in some general practices, residential aged care facilities, Aboriginal health services, specialist practices and emergency departments in South Australia, so this opens up new opportunities for telehealth in community, residential, and primary care.

Acknowledgements

We thank the South Australian Department of Health for funding to conduct this study.

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