

# Telemedicine: Rethinking Healthcare Roles for Smarter Care

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## Abstract

**Purpose** A pilot was conducted to examine the utility and value of using video-conference equipment for outpatient clinics in the remote West Coast District Health Board.

**Method** Video-conference equipment, already installed in Greymouth Hospital and Buller Health outpatient clinics, was adjusted for optimal effectiveness. Clinicians were invited to participate. Clinics were booked for five months. Participants included seven clinicians from six specialisations, 51 patients, 17 patient companions, clinic co-ordinator, project team of four and governance group of 11. Data were gathered by means of interviews with clinicians, clinic utilisation reports, questionnaires from patients and their companions, minutes of project meetings and discussions with managers.

**Findings** Telehealth appointments are different from 'usual' outpatient clinic appointments. The equipment changes the way a clinic is run, the dynamics between the patient and clinician are different and criteria for booking patients are different. This resulted in rethinking roles for clinicians (determining who is appropriate for telehealth), and development of a new telehealth co-ordinator role that spans the region in which telehealth operates.

**Conclusions** A new role of telehealth co-ordinator is proposed in which there are new functions and activities (clinical, support and administrative) that incorporate training, unambiguous booking of telehealth clinics, and advanced regional support to embed telehealth as 'business as usual.'

## 1. Introduction

A middle aged man enters the consulting room in the outpatient clinic, shakes hands with the clinic co-ordinator and sits down at the desk. On the desk is a neat arrangement of digital stethoscope, blood pressure measuring device, pulse oximeter and camera. He looks up at the large screen high-definition monitor on the other side of the desk and greets his doctor. Ten minutes later, after discussing the laboratory results from last week's operation, he returns to work. The clinician could have been a general surgeon, psychiatrist, oncologist, speech therapist, dietician or nurse specialist. This scenario was played out in the outpatient clinic in Westport, a remote mining village in New Zealand, during a recent evaluation of the suitability of telehealth for ambulatory non-acute care.

An hour and a half of driving on a treacherous coastal road to Greymouth separates the patient and clinician. Usually clinicians travel to Westport or patients to Greymouth, which is home to the 'base hospital' services. The patient was unaware of any role adaptations that were made to accommodate this telehealth – the clinicians and clinic co-ordinator were indeed rethinking their roles.

Telehealth is the delivery of healthcare at a distance using technology [1]. Telehealth comes in many forms, e.g. video-conference, phone calls, social media [2]. It could involve point of care services, e.g. clinician working with a patient and or family via video-conference as in the paediatric oncology services in New Zealand [3, 4]. Another common use of telehealth services is Continuing Medical Education (CME) where clinicians working in remote areas are able to participate in distance learning initiatives via video-conference, the phone, and social media [4]. Telehealth via video-conference requires broadband, equipment in a designated space in the services where the clinicians work and, if patients are included, in patient/family homes if appropriate [5]. There are set-up guidelines that advise users on the

position of the camera and video monitor, the nature and intensity of lighting, background noise and how to achieve eye contact [6].

The principles and tools of telehealth are used in a range of ways, e.g. providing a virtual clinic for people with diabetes [7]. Neurosurgeons have found telehealth to be useful for appropriately allocating resources - acutely ill patients are reviewed by video-conference (presented by the treating clinician in a satellite service to the neurosurgeon in a central service), triaged for care and referred to appropriate specialist services before transfer to specialist care. Speech therapists have found that video-conference technology supports therapy – the sound and picture are sufficient for the therapists to see and hear nuances in sound and movement to be able to deliver therapy [8]. Ear, nose and throat specialists in Alaska have found asynchronous use of store and forward technology a major contribution in improved access to care for those living in remote areas, e.g. photographs of post myringotomy surgery instead of face to face visits [9].

While the literature provides extensive evidence that telehealth is useful, it is not clear how the use of video-conference changes ambulatory non-acute care [10]. This paper presents the results of an evaluation of a pilot that explored the use of video-conferencing in outpatients' clinics at Buller Health served by clinicians based in Greymouth Hospital, in which the roles of the different participants required rethinking in order to support telehealth success.

## **2. Method: Evaluation process of pilot causing a rethink of clinic roles**

### **2.1. Context**

The West Coast District Health Board (WCDHB) serves a population living in the most rural and isolated region of New Zealand - more than 32,000 people, over an area of 23,000 square km [11]. Distances between communities are large, and travel to receive health services most often requires a long drive on the main north/south coast road between the base hospital in Greymouth and rural health centres, or across the Southern Alps to the tertiary centre in Christchurch.

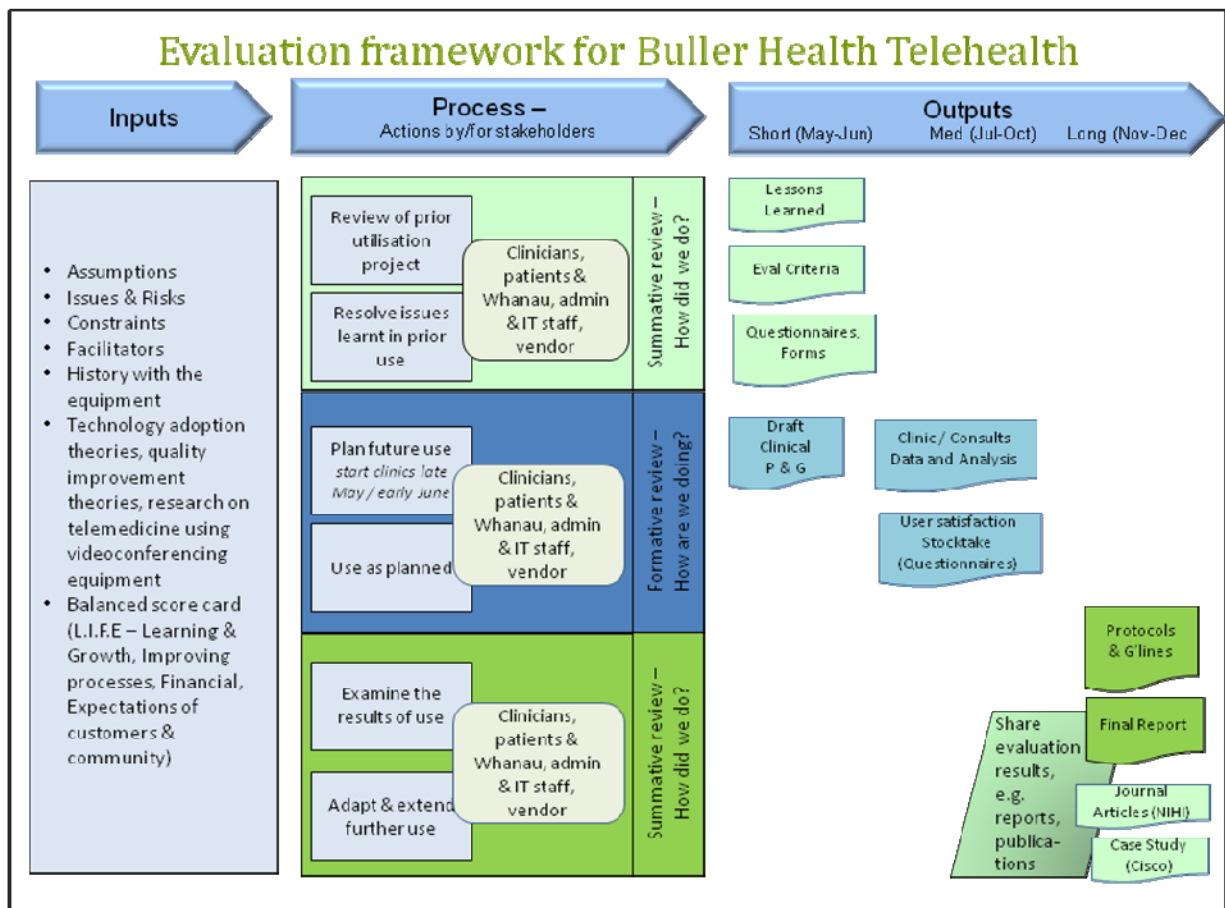
Only 64% of West Coast residents reside within 1 hour ('The Golden Hour') travel time by car from secondary hospital services. Only 2% are within 3 hours travel time by car from the nearest tertiary hospital at Christchurch [12]. To alleviate the difficulties in accessing care, mental health and paediatric oncology services have been delivered in this region by videoconference for over a decade. However, videoconferencing is most commonly used in this region for clinical education and staff meetings [3]. Cisco Systems International offered a trial of their HealthPresence system to see what works and what doesn't for telehealth, what is needed to create the 'right' environment for successful telehealth services [13]. A pilot project was run to explore and establish over a six month period what such a value proposition could be [14].

### **2.2. Evaluation process**

The first step was to design an evaluation framework, as depicted in Figure 1. This was based on established evaluation theory, using Cooksy's program logic model [15] to tease out assumptions and pre-existing conditions that could influence the evaluation. We applied the cycles of plan, act, review and modify (using lessons learned) that are characteristic of Action Research [16] to provide flexibility in the project and the ability to respond to changing conditions. We collected quantitative data in the form of service utilisation reports and questionnaires from patients. Qualitative data was collected in the form of interviews by phone at three and five months of the project's timeline; notes from discussions with managers, clinic co-ordinators and clinicians; outpatient clinic utilisation reports; and minutes of project team and steering committee meetings. The data were analysed thematically [17].

### **2.3. Equipment set-up and the outpatient environment**

The equipment was analysed and adjusted in terms of the guidelines for the set up and use of video-conferencing in healthcare [5, 6]. This involved moving the equipment in Greymouth Hospital from the Triage Room to a designated outpatient clinic room due to privacy concerns (the Triage Room is a semi-private room). The designated video-conference rooms in Greymouth and Buller Health outpatient clinics were dual purpose rooms – video-conference and face to face consultations were conducted. The equipment was easy to use and start up. A decision was made that if a clinician held a clinic using the equipment, all the patients for that day's clinic should be telehealth appointments. The room bookings process was adapted to accommodate video-conference consultations in line with this decision.



**Figure 1 - Evaluation framework for telehealth pilot**

Clinicians who provided services in Buller Health and were usually based in Greymouth were invited to participate. Email invitations were sent by the DHB’s CEO to all specialist doctors, nurses and allied healthcare professionals, e.g. dietician and speech therapist. Some specialists were invited by clinic staff to try out the equipment opportunistically, e.g. if the equipment had been switched on for a clinic and there was no-one in the consulting room, the clinician was invited to talk to a clinic staff member in Westport. Some specialists were invited to join a consultation being run by a colleague whose patient consented to a demonstration (e.g. dermatologist invited to view images taken with the video-conference equipment camera and discuss the result together).

Ethics approval was gained from the Upper South A Regional Ethics Committee, number URA/10/EXP/019.

### 3. Findings: Rethinking roles for supporting outpatient video-conference clinics

The HealthPresence equipment was designed for shared decision making between clinicians at the point of care, e.g. emergency service clinicians, and specialists at another site, e.g. a clinic in a specialist service [13]. As can be seen in Figure 2, it consists of a large monitor that provides a high definition video of the person ‘at the other end’. The desk where the patient sits contains biometric equipment for use in examining patients. Specialists were based in Greymouth and the patients attended their appointments in Westport. Figure 2 depicts the patient’s set up in Westport outpatient clinic.

#### 3.1. Participation in the project

According to the utilisation reports, a total of 1,551 patients from the Buller Health region attended clinics at Greymouth in 2009 and 2,999 attended clinics in Buller Health (where the clinicians commuted to from Greymouth). The number of patients attending telehealth appointments at Buller Health was 109 (or 0.02% of all appointments, assuming that a similar number of patients were seen in 2010). Of the 109 patients who attended telehealth clinics, 51 completed the patient questionnaire and 17 companions completed the companion questionnaire. Some of the patients attended repeat visits and were not asked to complete the questionnaire a second time.



**Figure 2 - Using the equipment set up in Buller Health outpatient clinic**

There are 17 clinic specialisations at Greymouth and 12 in Buller Health (as indicated in the clinic utilisation reports). Of the Buller Health clinics, 6 specializations participated in the evaluation (general surgery, oncology, nutrition, speech therapy, methadone, and adult mental health). Seven clinicians participated by running their clinic from Greymouth as telehealth consultations. On one occasion a Buller Health GP joined an oncology clinic and participated in what he referred to as a shared consultation. On another occasion a patient who had presented in the Buller Health Emergency Department with a foreign object in his eye was seen via video conference by an ophthalmologist in Greymouth, resulting in the patient not requiring transfer to Greymouth.

We had a project team of four people (manager, clinic coordinators, information systems support) who had been recruited from WCDHB, and a steering committee of 11 stakeholders (senior clinical and management).

### **3.2. Lessons learned**

The AR process built in the capacity to review and learn from experience. The lessons we learnt about roles were as follows. There were three cycles (Figure 1) – (1) summative review of pre-pilot use of the equipment, establishment of evaluation criteria and establishing lessons learned, (2) planning for future use of the equipment including draft protocols and guidelines, and first use of the equipment, and (3) retrospective review of five months of telehealth, final protocols and guidelines, and adaptation of processes and equipment for ongoing use.

The summative evaluation review (Figure 1, first AR cycle) revealed that the equipment was not placed optimally in either site. We adjusted the set-up and found that the equipment required ‘real estate’ in the outpatients department at Greymouth that was not readily available. Setting up space for telehealth requires deliberation and a considered response to its ‘real estate’ claim. Generally speaking, this kind of activity and responsibility is not new to managers. We found that the specific requirements for video-conference equipment in clinics requires collaborative consideration between managers, business analysts, the information systems manager (for technological considerations), the infection control clinicians (regarding the safe use and reuse of the additional clinical equipment) and policy makers in the service (regarding the appropriate use of telehealth, its safety, implications on quality of care, and medico-legal requirements).

During the second AR cycle we found that booking the ‘telehealth room’ (in Greymouth and Buller) for video-conference clinics did not give a clear enough message to other clinicians that the room was indeed not available to them. It appeared that clinicians used specific rooms out of habit (“I always use that room for my clinic”) and, despite repeated messages about the room being used for telehealth at certain times, they walked in on consultations. A solution came in the form of a sign on the door saying “Telehealth clinic in progress, do not disturb.” In both Greymouth and Buller, the clinic co-ordinators’ roles adopted the task of ensuring that clinics were not interrupted and that the room was not double-booked. Several solutions were explored to reduce the additional load on these co-ordinators, resulting in a recommendation for a telehealth coordinator role (described below in the discussion).

To facilitate clinic bookings for telehealth and reduce the risk of double booking, the Clinic Bookings Unit created a ‘telehealth clinic’ in the electronic patient management system. The booking process was difficult because of the dual

use of the designated telehealth rooms for telehealth on some days and ‘business as usual’ face to face clinics on other days. The bookings team relied on the clinic co-ordinator in Buller to differentiate telehealth patients from face to face patients.

We assumed that not all patient appointments were appropriate for telehealth clinics. In response to this assumption, we established a process in which the clinic co-ordinator asked the participating clinicians which patients should be allocated an appointment in the telehealth clinic. We developed protocols and guidelines for the services to follow [18]. The process was modified as the clinic coordinator learnt the criteria applied by each clinician, calling the clinician to confirm the selection of patients and discuss specific requirements prior to allocating an appointment to the selected patients. This process involves some clinical insight and raises the question about who the best person is for determining telehealth appointments – the ‘business as usual’ clinics do not require this kind of judgement from clinic co-ordinators.

The general practitioner (GP) who participated by joining a specialist consultation with his patient and oncologist commented on the potential for telehealth to support shared care. The GP and oncology nurse both felt that the convenience of telehealth gave them an opportunity to participate more fully as members of their patient’s care team because they could attend the specialist appointment with the patient. The general surgeon changed his pre-operative appointment style and content so that patients could meet him in a telehealth appointment prior to minor surgery and discuss the procedure, e.g. colonoscopy. On the day of the procedure the surgeon completed the physical examination that would normally have been done in the first appointment.

At times things went wrong with the equipment and a call was made to the information systems (IS) support team for help. While the IS support team claimed that the technical support was not a challenge, it did become evident that any unexpected down time could not be tolerated during a telehealth clinic, especially if the consultation relied on visual contact, e.g. during a speech therapy session. The one time that the system did fail was during a nutrition consultation and the dietician switched over to the phone to complete the session. If equipment wasn’t working as expected, e.g. couldn’t turn the handheld camera on or focus it, the consultation was deemed compromised. The IS support person’s role became extended to (1) be on call during telehealth clinics, (2) train staff to use the IT-linked biometric equipment, such as the hand held camera, and (3) ensure that the equipment was always in working order. This role may become redundant once telehealth clinics become ‘business as usual’ in the future.

### **3.3. Using protocols and guidelines to help rethink roles, rules and activities**

One of the deliverables of the evaluation was the development of telehealth protocols and guidelines to support the use of video-conferencing in ambulatory non-acute specialist care [18]. These protocols and guidelines took into consideration the WCDHB’s telehealth guidelines of 2002 and the New Zealand Medical Association’s position statement [19], which states that face to face consultation with patients is the ‘gold standard.’ During the interviews with specialists we asked about this position.

One specialist stated that video-conference is a face to face consultation, especially with the high resolution video, excellent sound, the biometric equipment for remote examination of the patient, and the high resolution hand-held camera. The doctor claimed that all the properties of face to face consultations were present in the video-conference consultation, except being able to touch the patient. The speech therapist agreed, saying that the video quality was really good, and even though the sound was ‘a bit flat’ effective therapy was possible. One clinician was unconvinced that telehealth is an acceptable way of conducting outpatients consultations, even after a convincing demonstration. A patient commented in the questionnaire that “It’s so real. It’s more than face to face.”

Others claimed that telehealth liberated them from the constraints of face to face consultation. They observed that telehealth extended their capacity as clinicians in that they were able to see more patients sooner without leaving Greymouth, and that their clinics were more flexible (some patients could be fast-tracked off the waiting list because of the increased availability of the clinician for certain types of consultation, e.g. preoperative planning for minor surgery).

## **4. Discussion: Rethinking extended tasks and a new role**

In summary, this evaluation aimed to establish the value of using video-conferencing telehealth in specialist outpatient clinics in Buller Health, where the specialists were based in Greymouth Hospital. The patients attended clinic appointments at Buller Health. We set up a pilot project to conduct the evaluation and invited clinicians, managers, clinic co-ordinators and IS support people to participate. We found that those who were willing to use video-conference equipment for outpatient appointments made changes to roles.

The set-up of the equipment was adjusted to improve privacy, access and everyday use, e.g. desk height for appropriate eye contact. The IS support team incorporated the maintenance of the equipment and its operation into their everyday support roles to ensure minimum down-time and best ease of use for clinic staff. Ease of use is key to adoption of technology [20] and was illustrated by the lack of enthusiasm of some clinicians to use the technology after a minor failure, e.g. difficulty using the hand-held camera. The minor role changes of supporting new technology were readily adopted by the IS support team.

Telehealth appointments are different from everyday specialist clinic appointments. The equipment determines where the appointment occurs. The interpersonal dynamics between patient and clinician and between clinicians are influenced by the properties of the equipment. New opportunities arose for shared care where primary care physicians can join patients in their specialist appointment, e.g. oncology (where a nurse traditionally accompanies the patient). The general surgeon modified his appointment to accommodate pre-operative patients from Buller without the necessity of travel. Clinicians became available in new ways, e.g. shared care. A new kind of decision arose – who is the right kind of patient for this kind of appointment? The selection of patients was influenced by a range of factors - nature of appointment, patient’s capacity to travel, nature of patient-doctor relationship, and how the patient was expected to react to using the equipment.

#### 4.1. Recommending a new role: Telehealth Co-ordinator

A critical success factor for telehealth services should be the formal establishment of a new role, Telehealth Co-ordinator [21]. The role should be established for each telehealth site, and will be part time or full time, depending on status as a host or remote site, clinic volumes, types of clinics (telehealth only vs. combined telehealth and face-to-face, acute consultations, therapy, specialty), scope of the role and numbers of clinical providers participating. Nursing experience is required if the role includes care planning, patient selection for telehealth (based on criteria agreed with clinicians) and presentation of patients. Figure 3 shows the high level roles and relationships for telehealth co-ordinators in a Canterbury DHB/West Coast DHB telehealth network.

The telehealth clinic co-ordinators at the host and remote sites need to have a ‘helicopter view’ and a clear division of responsibilities to avoid inefficiencies and resource conflicts. Overall responsibilities for the telehealth co-ordinator role(s) should include the following:

- Clinical role
  - Patient selection for telehealth appointments in conjunction with clinicians and based on agreed criteria
  - Liaison with management and clinical providers on planning care pathways and appropriate usage of telehealth resources
  - Participation in defining telehealth equipment, network and facilities requirements

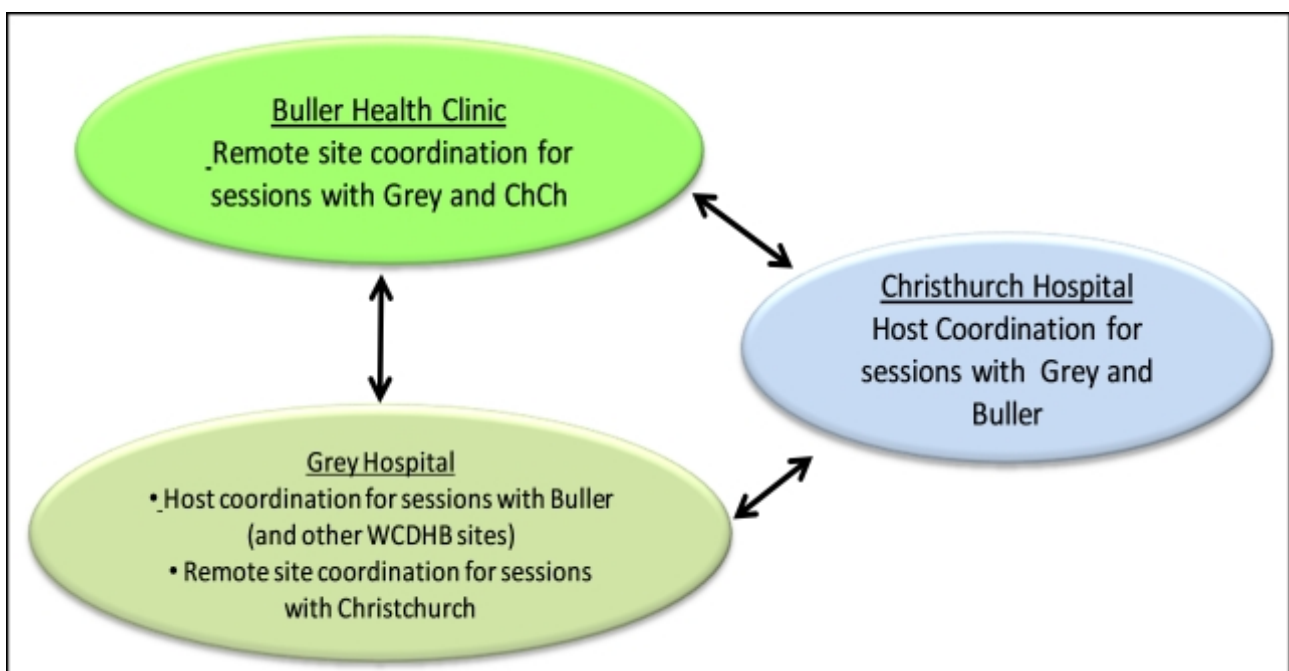


Figure 3 - Telehealth Co-ordination role for outpatient clinics

- Telehealth support role
  - Super- user knowledge of protocols & guidelines, detailed procedures, telehealth equipment / network /systems
  - ‘On the day’ support to ensure readiness of telehealth room and equipment, briefing patients in advance (those new to telehealth clinics)
  - Liaison with co-ordinators at other sites, based on agreed separation of duties, to ensure that telehealth works as a network service and succeeds in individual clinics
  - Liaison with Information Services for equipment, network and systems support
  - Training for new users, revision training for existing users, keeping user documentation up to date
  - Promotion of telehealth resources with clinical and administrative staff and patients
- Administrative role
  - Unambiguous booking of clinicians, rooms, patients
  - Ensuring availability of appropriate patient information (files/electronic health record data) at clinician’s site on day of clinic

## 5. Conclusion

A telehealth pilot was run to establish the potential for the use of video-conference equipment (and associated biometric equipment) in outpatient clinics where the clinicians were based at Greymouth Hospital and patients in Buller Health, 100km away. Clinicians, clinic co-ordinators, and patients and their companions were invited to participate. The five months of booked clinics demonstrated that for telehealth to succeed in outpatient clinics, roles must change. The IS support role remains largely unchanged, accommodating the new technology and the clinical need for no down time during a clinic. Organising clinics and supporting clinicians introduced a clinical component that is not usually expected of clinic co-ordinators, where the clinician usually decides simply that a patient should attend a clinic. Telehealth introduces a need to differentiate between ‘usual clinic patients’ and ‘telehealth clinic patients’ which requires clinical skill and knowledge. Telehealth also introduces a need for clinic co-ordinators to liaise with their counterparts and the Booking Unit in other services in new ways to ensure that the telehealth appointments run smoothly. Until telehealth becomes ‘business as usual’, training and super-user support should be provided ‘just in time’ (as needed).

Further research is recommended to examine the clinical, administrative and telehealth support role of telehealth co-ordinators. On the flipside, more investigation is suggested for examining the training that clinicians require for successful, safe telehealth in terms of appropriate selection of patients for outpatient clinics, the effect of video-conference equipment on the patient-doctor relationship, and the opportunity for shared care that telehealth offers.

## 6. Acknowledgments

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## 7. References

- [1] Whitten P, Davenport Sypher B, Patterson II JD. Transcending the technology of telemedicine: An analysis of telemedicine in North Carolina. *Health Communication*. 2000;12(2):109 - 35.
- [2] Smith A, Gray L. Telemedicine across the ages. *The Medical Journal of Australia*. 2009;190(1):15-9.
- [3] Al-Qirim N. Championing telemedicine adoption and utilization in healthcare organizations in New Zealand. *International Journal of Medical Informatics*. 2007;76(1):42-54.
- [4] Telehealth Working Group. Stocktake of telehealth in New Zealand. Wellington: Ministry of Health 2005.
- [5] Jarvis-Selinger S, Chan E, Payne R, Plohman K, Ho K. Clinical telehealth across the disciplines: lessons learned. *Telemedicine and e-health*. 2008;14(7):720 - 5.
- [6] Clarke M, Thiyagarajan CA. A systematic review of technical evaluation in telemedicine systems. *Telemedicine and e-health*. 2008;14(2):170 - 83.
- [7] Powell J, Jennings A, Armstrong N, Sturt J, Dale J. Pilot study of a virtual diabetes clinic: satisfaction and usability *Journal of Telemedicine and Telecare*. 2009;15:150-2.

- [8] Grogan-Johnson S, Alvares R, Rowan L, Creaghead N. A pilot study comparing the effectiveness of speech language therapy provided by telemedicine with conventional on-site therapy. *Journal of Telemedicine & Telecare*. 2010;16(3):134-9.
- [9] Kokesh J, Ferguson AS, Patricoski C. Telehealth in Alaska: Delivery of health care services from a specialist's perspective. *International Journal of Circumpolar Health*. 2004;63(4):387 - 400.
- [10] Ekeland AG, Bowes A, Flottorp S. Effectiveness of telemedicine: A systematic review of reviews. *International Journal of Medical Informatics*. 2010;79:736 - 71.
- [11] Statistics New Zealand. QuickStats about West Coast Region. 2006 [29/11/2010]; Available from: <http://www.stats.govt.nz/Census/2006CensusHomePage/QuickStats/AboutAPlace/SnapShot.aspx?id=1000012&type=region&ParentID=1000012>
- [12] West Coast District Health Board District Strategic Plan 2005-20152005: Available from: [http://www.westcoastdhb.org.nz/publications/documents/strategic\\_plan\\_docs/2005-2015\\_strategic\\_plan.pdf](http://www.westcoastdhb.org.nz/publications/documents/strategic_plan_docs/2005-2015_strategic_plan.pdf)
- [13] Cisco. Cisco HealthPresence Solution. [1/12/2010]; Available from: [http://www.cisco.com/web/strategy/healthcare/cisco\\_healthpresence\\_solution.html](http://www.cisco.com/web/strategy/healthcare/cisco_healthpresence_solution.html)
- [14] Kerr P, Day K. Buller Health Telehealth Pilot: Evaluating an opportunity whose time has come. Greymouth: West Coast District Health Board2010 December 2010.
- [15] Cooksy LJ, Kelly PA. The program logic model as an integrative framework for a multimethod evaluation. *Evaluation & Program Planning*. 2001;24:119-28.
- [16] Day K, Orr M, Sankaran S, Norris AC, editors. The reflexive employee: action research immortalised? 7th ALARPM (Action Learning, Action Research and Process Management Association) & 11th PAR (Participatory Action Research) World Congress; 2006 22 August 2006; Groningen, The Netherlands.
- [17] Miles MB, Huberman AM. *Qualitative Data Analysis: An Expanded Sourcebook*. Thousand Oaks: Sage Publications; 1994.
- [18] Kerr P, Day K. Buller Health Telehealth Pilot: Protocols and Guidelines. Greymouth: West Coast District Health Board2010 December 2010.
- [19] NZMA. Telemedicine - Position Statement. 2008 [1 December 2010]; Available from: <http://www.nzma.org.nz/news/policies/telemedicine.pdf>
- [20] Venkatesh V, Davis FD. A theoretical extension of the Technology Acceptance Model: Four longitudinal field studies. *Management Science*. 2000;46(2):186 - 204.
- [21] Mauldon E. The use of and attitudes towards telehealth in rural communities. *Australian Journal of Primary Health*. 2007;13(3):29 - 34.