ORIGINAL RESEARCH

Challenges faced in implementation of a telehealth enabled chronic wound care system

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A B S T R A C T

Introduction: In the rural Midwest region of Western Australia (WA), wound care is a major burden on the healthcare system. Optimal wound care was found to be impeded by issues that included the involvement of multiple healthcare providers, incomplete and inconsistent documentation, and limited access to expert review. A telehealth solution was trailed in 2007. Objective: To describe the systemic barriers encountered in implementing a telehealth program in rural WA and to provide recommendations for future telehealth initiatives.

Methods: This study trialled the use of a shared electronic wound imaging and reporting system in combination with an expert remote wound consultation service for the management of patients with chronic wounds in the Midwest of WA. The trial sites included rural hospital out-patient clinics, a private domiciliary nursing service, residential aged care facilities, general practices and a podiatry clinic. The implementation conformed to accepted best practice in introducing telehealth initiatives.

Results: During the trial 12 sites had the relevant software installed and were able to access a central server. Although a total of 41 patients with chronic wounds were enrolled, four sites did not enroll any patients and only two sites successfully incorporated the system into regular practice. Major obstacles were workforce issues and significant delays in installing the software at some sites. Only 47% of the healthcare providers trained to use the software at the beginning of the trial were still employed when the

trial ended. Prolonged periods of vacant positions at one remote clinic and an aged care facility made it impossible for the remaining providers to allocate time for using the wound care software.

Conclusion: The disease burden of the patient group, funding models and workforce shortages frustrated the successful adoption of an evidence based strategy that was known to improve health outcomes.

Key words: digital imaging, electronic health records, telehealth, telemedicine, wound care.

Introduction

Chronic and complex wounds often have prolonged healing times and require frequent assessment and treatment from a healthcare professional. Their management represents a significant burden on the healthcare system, with the annual cost of treating chronic wounds worldwide estimated at US$7 billion[1].

In the rural Midwest region of Western Australia (WA), an audit of outpatient services found that the management of conditions involving wounds constituted 41% of all presentations. In the region wounds are managed in diverse care settings, such as an out-patient clinic, at the hospital, or by a GP or domiciliary nurse.

A regional scoping study found that optimal wound care was impeded by constraints related to multiple healthcare providers; poor confidence and limited training in the management of chronic wounds among nurses; limited access to expert review; incomplete and inconsistent wound history and management documentation; and no processes or tradition for secure sharing of medical records among providers.

Electronic healthcare systems can assist in addressing such problems. Remote expert review of digital wound images and patient care in the Kimberley region of WA has demonstrated significant patient care outcomes[2]. Continuity of care may also be improved with the sharing of timely, accurate and secure electronic information between the public and private sectors, and between the tertiary,

secondary and primary care sectors[3,4]. In order to test the feasibility of a telehealth solution to the chronic wound care problems in the Midwest, a project called 'Wound Witch' was developed.

Wound Witch used a modified version of AMWIS[TM] (http://www.medseed.com/page/our_products.html - the electronic software program used in the Kimberley region) to record wound history and treatment, store digital images of the wound and refer for expert review and consultation. Information exchange was to be achieved by storing patient data on a central server, ensuring its availability at point-of-care to all regional providers who managed wounds, and the urban-based wound care nurse consultant. The project team was aware that establishing successful rural telehealth initiatives can be challenging.

An Australian telehealth leader has proposed seven principles for the successful development and implementation of a telemedicine system[5]:

1. Telemedicine applications and sites should be selected pragmatically, rather than philosophically.
2. Clinical drivers and telemedicine users must own their own systems.
3. Telemedicine management and support should follow best practice business principles.
4. The technology should be as user friendly as possible.
5. Telemedicine users must be well trained and supported, both technically and professionally.

6. Telemedicine applications should be evaluated and sustained in a clinically appropriate and user-friendly manner.
7. Information about the development of telemedicine must be shared.

Maldron surveyed healthcare providers regarding their perceived barriers to telehealth and identified deficits in user experience, technological and managerial support, and resourcing of equipment and staff time[6]. Yellowlees[5] and Maldron[6] also highlighted the need for telehealth applications to be simple and located on desktop computers that are part of clinicians' usual working environment. This view is supported by Nesbitt et al. who added that informed and willing staff are critical to successful implementation of telehealth[7]. These conclusions are similar to those reached in rural America[8,9] and Canada[10].

Methods

Description of intervention and evaluation methods

The barriers, recommendations and principles outlined by Yellowlees[5] and others were considered in the design of the Wound Witch trial, which took place from May to December 2007. In particular, Wound Witch provided a telehealth application that had adequate IT and clinical support, used tried and tested software, provided sufficient funding, did not require real-time specialist consultation, confirmed managerial and organisational support, and was to be used in an identified area of need (Fig1).

Prior to designing the trial, meetings were held with managers and clinicians from regional and tertiary health organisations. This ensured the project met priority needs and was considered feasible. Ethical approval to conduct the trial was granted by the University of WA Human Research Ethics Committee.

An information session was held for all potential sites in the region. Local managers and clinicians had the opportunity to raise questions about IT support, wound care training and other practical issues. Twelve of the 14 sites represented at the session agreed to participate. The sites consisted of two private general practices, one private podiatry service, one private hospital, two residential aged care facilities, one not-for-profit domiciliary nursing service, a hospital in the home and four rural or remote WA health clinics.

To prepare the sites, participating healthcare providers were offered 2 hours of education in basic wound care. They were also interviewed to determine their level of confidence in providing wound care and to ascertain their existing wound management practices. The number of patients currently receiving care for chronic wounds at each site was recorded as a baseline estimate of caseload.

Following this, AMWIS software was installed at all 12 healthcare sites on a computer located where patients were treated. The AMWIS system enables healthcare providers to describe and annotate a digital picture of a wound, and record patient information; it has been demonstrated to be user friendly in many different healthcare settings. Once mastered, it takes less than 5 min to enter a patient's data, the anticipated time for documenting in paper notes. The AMWIS system offers the facility to store an objective wound assessment, care plan interventions and track healing outcomes from a digital image.

Wound Witch used an adapted AMWIS program that stores patient records in a central MS SQL (Microsoft; http://www. microsoft.com/sqlserver/2008/en/us/product-information. aspx) wound database, in accordance with National E-Health Transition Authority guidelines. The central server database enabled all healthcare providers involved in treating a patient to have immediate updated information at their site. The clinical expert (who also had AMWIS loaded on a computer with internet access) reviewed recently posted or updated patient records and provided advice on the characteristics of the wound and management strategies.
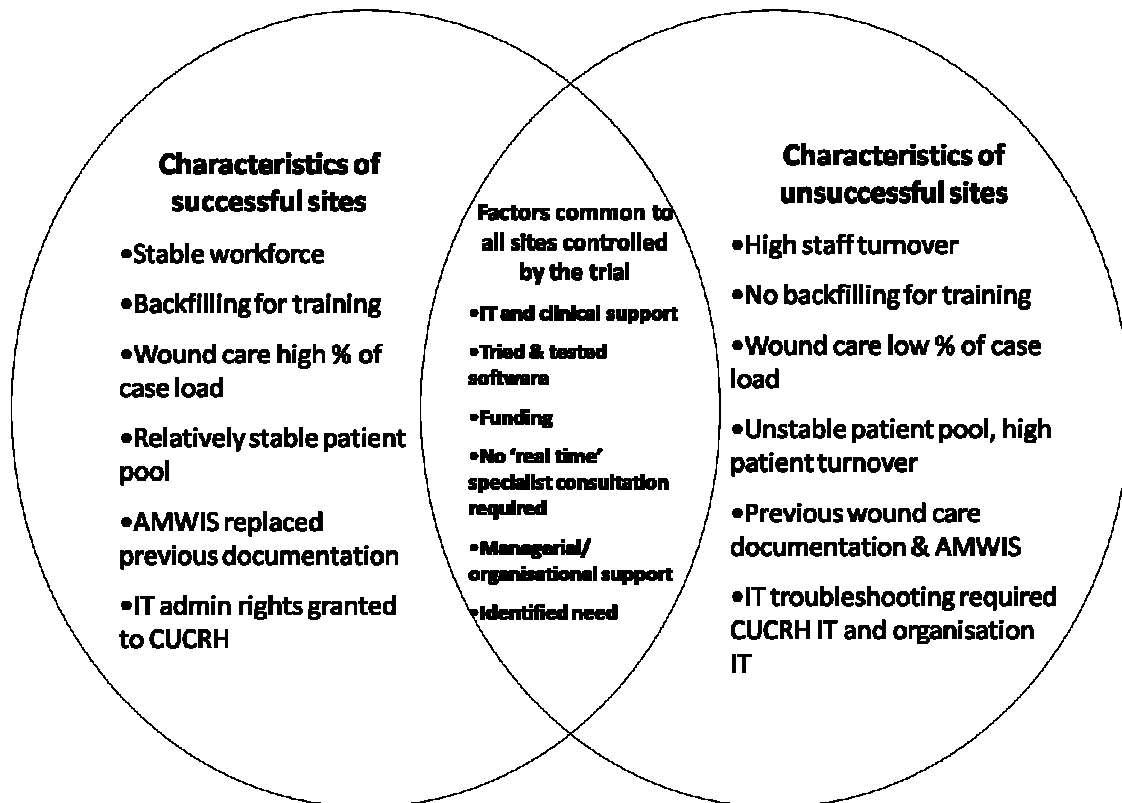
Characteristics of successful sites

- Stable workforce
- Backfilling for training
- Wound care high % of case load
- Relatively stable patient pool
- AMWIS replaced previous documentation
- IT admin rights granted to CUCRH

Factors common to all sites controlled by the trial

- IT and clinical support
- Tried & tested software
- Funding
- No 'real time' specialist consultation required
- Managerial/ organisational support
- Identified need

Characteristics of unsuccessful sites

- High staff turnover
- No backfilling for training
- Wound care low % of case load
- Unstable patient pool, high patient turnover
- Previous wound care documentation & AMWIS
- IT troubleshooting required CUCRH IT and organisation IT

Figure 1: Factors affecting the implementation of the Wound Witch

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Training was carried out at each site immediately following the installation of AMWIS. In groups of no more than three, participants were shown how to use AMWIS with a hypothetical patient. Training was offered repeatedly with no restriction on the number of training sessions for an individual participant. Each training session lasted for 1 hour and all individuals attended a minimum of two training sessions. All training was conducted by the project officer, an experienced rural and remote nurse. Funding was made available through the project to back-fill nurses while they attended training, ensuring the budget of the participating health organisation was unaffected.

A flow chart of the trial protocol was developed and distributed to trial sites to facilitate processes and understanding (Fig2). All patients who presented to the participating sites with wounds were assessed for eligibility. All wounds present for 3 weeks or longer, or assessed to have a healing time of more than 3 weeks were eligible for recruitment to the trial. If patient consent was obtained the relevant patient information, assessment and treatment plan were entered into AMWIS, along with a digital image of the wound. Each time the healthcare provider treated the wound, the file was updated with new information or wound image. Healthcare providers were instructed to email the expert reviewer fortnightly, if required, for advice. The expert reviewer then accessed the server and relevant patient information, viewed the most recent photograph and treatment regimen, and added advice to the record. Scheduling conflicts were minimised because it was not necessary for the rural healthcare provider and the urban specialist to be available at the same time.
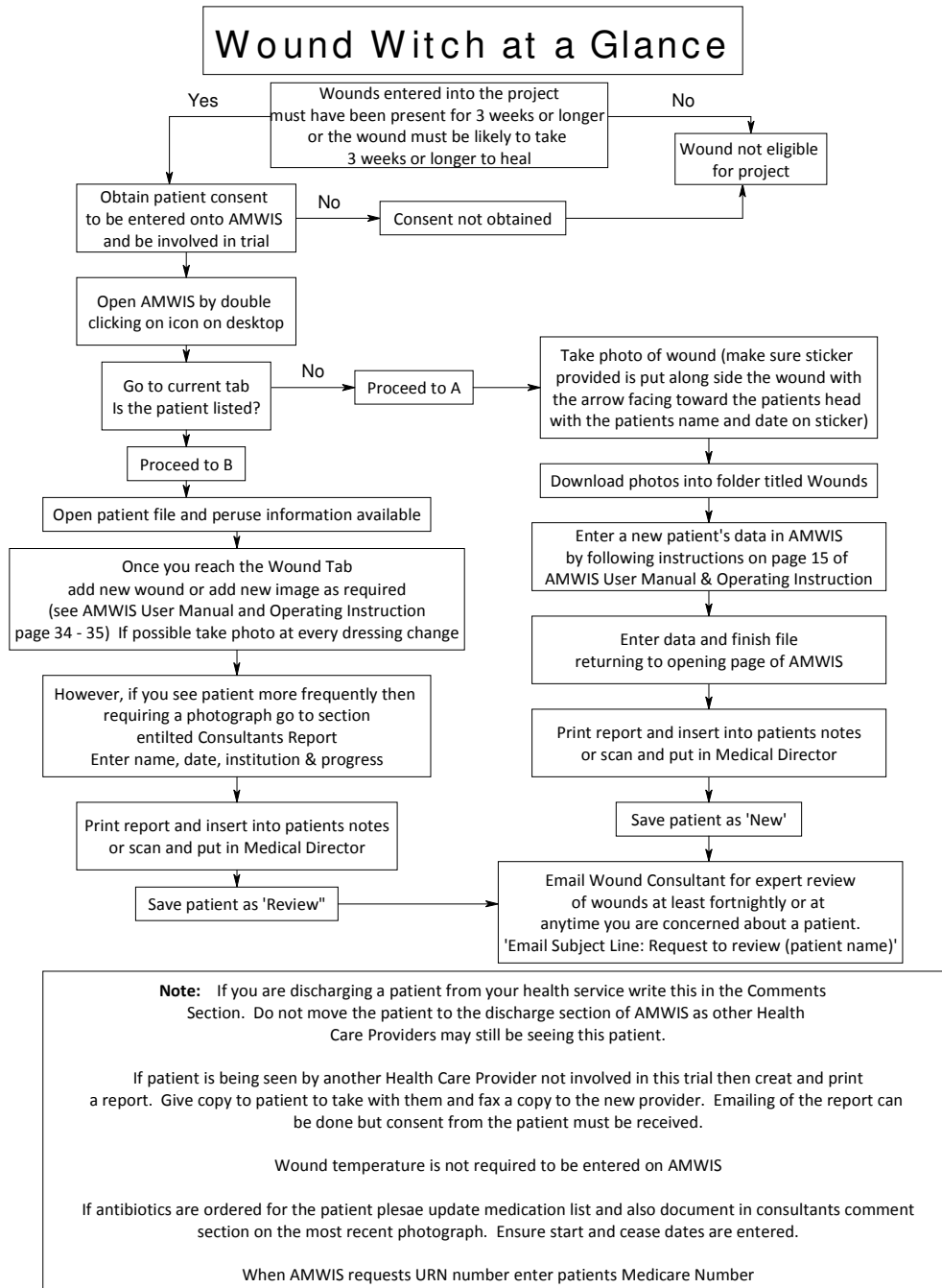
Wound Witch at a Glance

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                          Wounds entered into the project
  Yes                  must have been present for 3 weeks or longer      No
                            or the wound must be likely to take
                                3 weeks or longer to heal                        Wound not eligible
                                                                                   for project

    Obtain patient consent             No
    to be entered onto AMWIS                      Consent not obtained
    and be involved in trial

    Open AMWIS by double
    clicking on icon on desktop                                    Take photo of wound (make sure sticker
                                                                   provided is put along side the wound with
      Go to current tab        No                                 the arrow facing toward the patients head
      Is the patient listed?          Proceed to A                 with the patients name and date on sticker)

         Proceed to B                                             Download photos into folder titled Wounds

 Open patient file and peruse information available               Enter a new patient's data in AMWIS
                                                                   by following instructions on page 15 of
   Once you reach the Wound Tab                                    AMWIS User Manual & Operating Instruction
   add new wound or add new image as required
   (see AMWIS User Manual and Operating Instruction                     Enter data and finish file
   page 34 - 35)  If possible take photo at every dressing change     returning to opening page of AMWIS

  However, if you see patient more frequently then                 Print report and insert into patients notes
   requiring a photograph go to section                              or scan and put in Medical Director
   entilted Consultants Report
   Enter name, date, institution & progress                           Save patient as 'New'

   Print report and insert into patients notes
   or scan and put in Medical Director                     Email Wound Consultant for expert review
                                                            of wounds at least fortnightly or at
        Save patient as 'Review"                            anytime you are concerned about a patient.
                                                            'Email Subject Line: Request to review (patient name)'
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Note: If you are discharging a patient from your health service write this in the Comments Section. Do not move the patient to the discharge section of AMWIS as other Health Care Providers may still be seeing this patient.

If patient is being seen by another Health Care Provider not involved in this trial then creat and print a report. Give copy to patient to take with them and fax a copy to the new provider. Emailing of the report can be done but consent from the patient must be received.

Wound temperature is not required to be entered on AMWIS

If antibiotics are ordered for the patient plesae update medication list and also document in consultants comment section on the most recent photograph. Ensure start and cease dates are entered.

When AMWIS requests URN number enter patients Medicare Number

Figure 2: Trial protocols

The project officer stayed in regular telephone and email contact with all sites, trouble-shooting problems, offering additional education and documenting any problems and successes in the implementation of the system. A diary of all

encounters was kept in order to analyse the implementation process. An IT officer was also available to deal with technical problems as they arose. Healthcare providers were not required to set up or maintain the software; all software interaction was directly related to their work.

At the end of the trial the project officer interviewed all trained healthcare providers remaining at participant sites about their experience of using Wound Witch.

Results

Table 1 summarises the implementation of Wound Witch across the 12 sites. Software was installed within the first week of the trial in 6 sites (two aged care facilities, hospital in the home, the podiatry practice, the domiciliary nursing service and one general practice). These sites had 15 weeks in which to use Wound Witch. At the remote site and the other general practice it took 6 weeks to install the software, 8 weeks in the three rural clinics, and 13 weeks in the private hospital. On average, sites had less than 11 weeks use of the system before the trial ended. Delays were largely due to the time expended obtaining approval from distant decision-makers for permission to alter firewalls and other security system features to permit access to an external central server.

Although software was installed at all 12 sites, 4 sites did not participate in the initial wound care training or preliminary survey, and subsequently did not enroll patients. At the remaining 8 sites the total number of patients with chronic wounds captured during the trial period was similar to the number being managed before the trial started. Approximately 40% of recruited patients were being cared for in the aged care setting and another 25% by the domiciliary nursing service. The AMWIS users at these sites demonstrated more confident use of the system than those at the 4 sites that did not register any patients. The reasons given by the 4 sites for lack of participation included no eligible patients during the study period, delays experienced in installing the software, and general workforce shortages.

Only 45% of the 18 staff trained in use of the software at the beginning of the trial were still working at participating sites at the end of the trial. Prolonged periods of understaffing resulted in a workforce crisis in at least one remote clinic and an aged care facility. It was reported that this made it impossible for the remaining staff to allocate time for using the AMWIS system. Staff shortages also negatively impacted on some clinicians' willingness to invest time in gaining confidence in using the system. The offer to backfill staff positions was not taken up because other personnel were not available to fill these vacancies.

All sites shared the common elements of the trial displayed in the intersection area of Figure 1. Analysis of the end-of-project interviews identified other elements associated with successful or poor uptake. The successful sites were aged care facility 1, hospital in the home, and the domiciliary nursing service. These sites had a higher number of patients with wounds and a more stable workforce; software installation occurred promptly and paper records were replaced with the AMWIS system. In addition to the 4 sites where no patients were enrolled, the 3 rural sites, a general practice and an aged care facility were unable to adopt the system effectively. This was primarily due to workforce shortages, but delays in software installation and low numbers of patients with wounds were also factors.

The interviews also illuminated the challenges associated with the provision of modern dressings and devices in private practice settings where there is no reimbursement scheme, except for that available to war veterans. This was a disincentive to be involved in wound care management. For example, a general practice nurse said that patients who had complex wounds that would take a long time to heal were referred to either the not-for-profit domiciliary nursing service or hospital in the home, in order to reduce practice costs incurred in purchasing dressing materials.

Table 1: Patients and staff detail according to participating sites

Service type	Site	Patients		Staff	
		No. with chronic wounds at baseline	No. with eligible wounds enrolled in trial	No. trained in AMWIS at start of trial	No. trained in AMWIS remaining at trial completion
Aged care	Facility 1	11	9	1	1
	Facility 2	8	8	2	0
West Australian Country Health Services sites	Rural site 1	5	4	2	1
	Rural site 2	4	1	1	0
	Rural site 3	6	1	1	0
	Remote site	2	0	1	0
	Hospital in the home	3	5	3	3
Private or not for profit organisations	GP surgery 1	3	0	2	1
	GP surgery 2	3	2	2	2
	Domiciliary care	6	11	2	1
Podiatry	–	DNR	0	1	1
Private hospital	–	DNR	0	0	0
Total	–	51	41	18	10

DNR, Did not respond.

Discussion

Considerable effort was put into designing a best practice tele-healthcare program. There was support from managers and clinicians at regional and local levels to address an area of health care considered a priority. Training was delivered as needed and at the point of care. The software was user friendly and IT support from the project was prompt.

The trial did have some limitations. Funding constraints meant the trial had to be completed in 6 months, and some sites had the system available for only a few weeks before the trial ended. Although arrangements were made to continue use of the Wound Witch system beyond the trial period with the same level of support, only the sites where it was already successful continued to incorporate the system in their regular wound care management. Time alone was not sufficient to overcome the other constraints. In addition, the project was unable to confirm the proportion of eligible patients enrolled; the baseline estimate was drawn from data up to several months old.

The Wound Witch project results highlight the relevance of service models, staff ratios and funding models to the adoption of telehealth innovations. The two most successful sites were an aged care facility and the domiciliary nursing service where chronic wound management was a feature of everyday practice. In addition, individual practitioners in these settings are likely to see the same patients over an extended period, and it could be assumed that they develop a greater commitment to the wound healing outcomes.

Residential, domiciliary and out-patient care services are funded according to the number of patients. Practices that enable patients to be treated more efficiently effectively 'buy' staff more time to care. Feedback from two of the high-use sites stressed that time-saving was a feature motivating continuing use of the Wound Witch. Nurses became more efficient at entering data and extended their wound care knowledge through consultation with the wound-care specialist. Cost efficiencies in wound management could therefore be anticipated with ongoing use.

The general practices in this trial did not have many patients with chronic wounds and rarely stocked the range of dressings and additional equipment recommended by the wound-care consultant. Because of the small case loads there

were no financial or time-saving incentives to adopting new wound-care practices. Recent discussions on the scope of the Commonwealth Medical Benefits Scheme fees may result in a funding model more sustainable for multidisciplinary private practices. However, the inability to access reimbursement for dressing materials will remain a disincentive for general practices to become active in wound-care management.

A number of the rural sites were part of a larger government or non-government organization, and local authority was not available to approve software installation and access a central server.

Previous research by Krupinski[11] and May et al.[4] identified staff turnover and shortages as having the potential to result in telehealth applications being used less often and by uninformed or inexperienced staff. In accordance with this, the most important barrier found to implementing Wound Witch in the present study was the chronic workforce shortage in rural and remote Australia. In such a setting the need for repeated staff training sessions becomes a high priority; however, it is difficult to backfill positions when only one or two nurses cover an entire service. This constraint does not augur well for the implementation of rural and remote quality-improvement or reform initiatives, such as the telehealth innovation described.

Conclusion

Wound care in rural areas is influenced by the experience of a range of health providers and the resources available. Patients who have a chronic wound may have it treated as part of routine care by their GP or the domiciliary care team, as an inpatient or in residential aged care. Coordination of wound care across a continuum of care providers has the potential to be enhanced by a shared electronic wound record. Moreover, access to remote expert consultation offers many advantages to patients and practitioners. However, until the fundamental issues of workforce shortages and reimbursement for the dressing materials,

devices and consumables used in wound management are addressed, the widespread uptake of shared patient electronic patient records to enable collaborative care among providers is unlikely.

The following recommendations are made:

1. Imaging and medical records software should permit web-based access and storage, in view of the technical and administrative difficulties inherent in creating new firewalls.
2. Staff should be relieved from their usual duties to attend training in the use of new systems, and collaborative effort should be expended generally on adopting time-saving telehealth initiatives.
3. Managers at participating sites should receive software training to ensure local and ongoing technical support.
4. Private practices should only be targeted for this type of service delivery if associated funding is available for reimbursement for use of consumables, such as wound dressings and devices.

Acknowledgements

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