

## The reported benefits of telehealth for rural Australians

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### Abstract

**Objective.** A literature review was conducted to identify the reported benefits attributed to telehealth for people living and professionals working in rural and remote areas of Australia.

**Data sources.** Scopus and relevant journals and websites were searched using the terms: telemedicine, telehealth, telepsychiatry, teledermatology, teleradiology, Australia, and each state and territory. Publications since 1998 were included.

**Study selection.** The initial search resulted in 176 articles, which was reduced to 143 when research reporting on Australian rural, regional or remote populations was selected.

**Data synthesis.** A narrative review was conducted using an existing 'benefits' framework. Patients are reported to have benefited from: lower costs and reduced inconvenience while accessing specialist health services; improved access to services and improved quality of clinical services. Health professionals are reported to have benefited from: access to continuing education and professional development; provision of enhanced local services; experiential learning, networking and collaboration.

**Discussion.** Rural Australians have reportedly benefited from telehealth. The reported improved access and quality of clinical care available to rural Australians through telemedicine and telehealth may contribute to decreasing the urban–rural health disparities. The reported professional development opportunities and support from specialists through the use of telehealth may contribute to improved rural medical workforce recruitment and retention.

**What is known about the topic?** An extensive international literature has reported on the efficacy of telehealth, and to a lesser extent the clinical outcomes and cost-effectiveness of telemedicine. Systematic reviews conclude that the quality of the studies preclude definitive conclusions being drawn about clinical and cost-effectiveness, although there is some evidence of effective clinical outcomes and the potential for cost-benefits. Little attention has been paid to the benefits reported for people who live in rural and remote Australia, despite this being a rationale for the use of telehealth in rural and remote locations.

**What does this paper add?** Patients in rural and remote locations in Australia are reported to benefit from telehealth by increased access to health services and up-skilled health professionals. Health professionals are reported to benefit from telehealth by up-skilling from increased contact with specialists and increased access to professional development. The review findings suggest that one strategy, the increased use of telehealth, has the potential to reduce the inequitable access to health services and the poorer health status that many rural Australians experience, and contribute to addressing the on-going problem of the recruitment and retention of the rural health workforce.

**What are the implications for practitioners?** The use of telehealth appears to be a path to up-skilling for rural and remote practitioners.

### Introduction

Telemedicine has been extensively reviewed internationally, with the key questions being – is telemedicine clinically- and cost-effective? Telemedicine is defined as 'the use of information and communications technology to provide health care services to individuals who are some distance from the health care provider'.<sup>1</sup> Telehealth is defined more broadly and includes administration and training in addition to clinical services.<sup>2</sup> The technology required for telehealth varies depending on whether communication takes place real-time (for example telephone; videoconferencing) or in a store-and-forward or pre-recorded

(facsimile messages; downloading of images via a secure web-server) format. Studies comparing the cost-effectiveness of telemedicine with conventional services are inconclusive.<sup>3,4</sup> Only a small number of disciplines where telemedicine is practiced have been shown to be clinically effective.<sup>1,2,4</sup>

One of the major advantages of telemedicine over conventional care is the potential for increased access to medical care for populations that experience a level of isolation such as prisoners,<sup>5</sup> persons working at sea, or in war zones<sup>6,7</sup> and the focus of this paper, those who reside in rural and remote locations.<sup>8,9</sup> Telehealth in Australia has continued to take advantage of

technological advances since the Royal Flying Doctor Service began the first telehealth service in the 1920s.<sup>10</sup> More recently, health workforce shortages in rural and remote Australia,<sup>11</sup> funding challenges,<sup>9</sup> the decreasing cost of and advances in technology<sup>8</sup> and the vast open spaces in rural Australia, accelerated the adoption of telehealth services, particularly since the early 1990s.<sup>12</sup>

Despite the documented increased access to and advances in the technology underpinning telehealth there is a dearth of literature on specific benefits to rural and remote populations. The rationale for this review is that despite rural Australians being one of the populations most likely to benefit from telehealth, to date the issue of benefits in this context has not been formally examined. The aim of the study was not to critique the quality of the studies reviewed but to elicit what the reported benefits are. The targeted approach of this narrative review has the potential to build on recent work such as that of Smith and Gray.<sup>13</sup>

## Methods

A computer assisted search of articles on Scopus (using telemedicine, telehealth, telepsychiatry, teledermatology, teleradiology, Australia, and each state and territory) since 1998 was conducted. The same search criteria were used with relevant journals and websites, which resulted in 176 articles. Papers that did not report research on Australian rural, regional or remote populations were discarded. Relevant government documents were included. The remaining 143 references were reviewed.

The current review adopts a framework developed for evaluating telehealth services where four areas of benefits may occur<sup>14</sup>: (1) patients and families; (2) medical providers; (3) participating hospitals; and (4) society. The emphasis of this review is on the two populations who potentially realise the greatest direct benefit from telehealth in rural and remote Australia. These are the general public who reside there and use health and medical services (patients and families), and the doctors, nurses and allied health staff who provide the services (health professionals).

## Results

The diversity of the research that reports on rural and remote Australian populations is highlighted by using examples in the text and by listing key papers in Table 1. The results are structured around the four areas where benefits may occur.<sup>14</sup>

### *Reported benefits to rural patients*

The benefits reported for rural patients are from studies conducted in a range of disciplines with the main benefits for rural patients being: reduced expense and inconvenience when compared with having to travel long distances to access a service; the improved access to services that a locally-provided specialist service offers and the improved quality of the existing clinical services (see Box 1). Although several studies anecdotally reported cost savings for patients using the telemedicine option, only one study measured this. This Queensland study compared the costs reported by families who travelled to the specialist hospital for an outpatient appointment with the costs reported by families who were able to see their specialist via videoconference. The results showed that 96% of patients who travelled to Brisbane to access

their specialist paediatric appointment had travel-related costs (parking, median \$10; fuel median \$10; meals median \$10), whereas only 21% of those who had a telemedicine appointment reported any such costs.<sup>15</sup>

Improved access to services is more difficult to quantify, but positive examples are reported in the literature. A review of telepsychiatry in Victoria involving 27 rural sites found that health professionals reported earlier assessment and treatment.<sup>16</sup> Likewise the use of telepsychiatry in rural South Australia successfully treated a woman with anxiety and depressive symptoms without travel to the capital.<sup>17</sup> A significant benefit of telemedicine for psychiatric patients is that they may remain in the community that is familiar to them and contains their support network. This promotes a better quality of life and potentially improved treatment outcomes.<sup>18</sup> In another example, videoconferencing in emergency care in a Victorian hospital resulted in fewer unnecessary patient transfers and more timely transfers.<sup>19</sup> Although the majority of Australian telehealth services are designed to augment existing services, occasionally a previously unavailable service has been provided. For example, in Queensland an innovation was a touch-screen pilot for the provision of information about diabetes and pain in an Aboriginal community<sup>20</sup> and the introduction of a telepsychiatry service in north Queensland, which provided the first access to psychiatric services in that community.<sup>21</sup>

Many studies outline the expected benefits of telemedicine but few articles report actual improvement in the quality of local services. However several examples exist. These are earlier assessment and treatment, improved continuity of care, reduced length of psychiatric inpatient stay, patients better resuscitated for transfer and better patient outcomes.<sup>16,18,19,22</sup> An Aboriginal health service network for rural General Practitioners (GP) provides information on Aboriginal health practice that has the potential to improve the quality of local services.<sup>23</sup>

### *Reported benefits to rural health professionals*

This review highlights several areas where direct benefits to rural health professionals occur: local access to continuing education and professional development activities, the ability to provide an enhanced local service, and indirect benefits through experiential learning from close contact with specialists in clinical work (see Box 1). Furthermore these benefits have flow-on effects to the health professional such as a perception of reduced isolation, improved communication and increased skill and confidence with information technology.

Several studies report the greatest use of videoconferencing networks to be continuing education and professional development. A review of the Queensland government's videoconferencing network showed that over a 2-year period 60% of usage was for education and professional support purposes and 40% for administrative work.<sup>24</sup> The education component of this network included participation in grand rounds and tutorials, meetings, working groups and advisory panels, unavailable without videoconferencing.<sup>13</sup> Similarly, in Western Australia 40% of use was for education, 30% clinical and 30% administration.<sup>25</sup> Likewise a national study of mental health telemedicine programs (except Victoria) found 83% provided professional education.<sup>26</sup>

**Table 1. Summary of telehealth projects and papers in Australia**

Key policy and discussion papers not listed. State abbreviations are: VIC, Victoria; SA, South Australia; WA, Western Australia; QLD, Queensland; NSW, New South Wales; NT, Northern Territory

Key papers	Discipline	Study summary	Similar studies and papers
<b>Patient benefits</b>			
Buist <i>et al.</i> <sup>16</sup>	Psychiatry	State network – 39 videoconferencing sites; 27 rural (VIC)	Networks: 6 papers (SA; VIC; QLD); Trials: 5 papers (QLD; NSW); Case studies: 1 (SA)
Smith and Gray <sup>14</sup>	Paediatrics	Videoconferencing consultations (QLD)	21 papers, ten sub-disciplines (QLD); 1 – support for paediatric nurses (NSW)
Barry <sup>37</sup>	Diabetes	Diabetic retinopathy screening since 1978 targeting Aboriginal Australians (WA)	2 papers on touch screen technology health information and screening trial (QLD)
Dillon and Loermans <sup>38</sup>	Radiology network	1996–2003: 19 teleradiology facilities (WA)	3 papers on a SA and NT project; 3 papers on a WA program
ACRRM (see www.rrmeo.com)	Dermatology	Queensland based teledermatology service became available nationally (national)	2 papers on trials (WA; NSW); 1 paper (QLD)
Mitchell <i>et al.</i> <sup>39</sup>	Renal network	An evaluation of user's attitudes in a renal dialysis unit.	2 papers on this network; 1 paper on renal dialysis at home
Cregan <i>et al.</i> <sup>19</sup>	Emergency care	Emergency depart. telemedicine system (VIC)	4 papers on this project
Mathews <i>et al.</i> <sup>40</sup>	Emergency care	Aero-medical retrieval (QLD)	Nil
Hall <i>et al.</i> <sup>41</sup>	Ophthalmology	Removal of corneal foreign bodies (NSW)	Nil
Ellis <sup>42</sup>	Wound care	Wound care telehealth project (WA)	Nil
Faulkner and McClelland <sup>43</sup>	Women's health	Video-conferencing presentations (QLD)	3 papers on this project
Margolis and Ypinazar <sup>10</sup>	Pharmacy	Royal Flying Doctor Service tele-pharmacy program (national)	Nil
Phillips <i>et al.</i> <sup>44</sup>	Support services	Palliative care (NSW)	2 case studies – videoconferencing for isolated carers (VIC); internet (VIC)
St. George <i>et al.</i> <sup>45</sup>	Nursing	Nurse led telephone triage services (national)	1 paper RTC home telenursing (QLD)
<b>Health professional benefits</b>			
BIGNAUT <sup>24</sup>	Networks	Video-conferencing network 1960–1999 (QLD)	Tasmania – GP telephone network; WA trial; 5 papers (QLD)
D'Souza <sup>46</sup>	Psychiatry	Video-conferencing pilot to 46 mental health workers and 20 GPs (SA)	Network: Buist <i>et al.</i> <sup>16</sup> see patient benefits; 2 papers-SA; 1 case study SA; video-conferencing – national
Barry <i>et al.</i> <sup>37</sup>	Aboriginal Australians	Aboriginal Australians trained to use cameras for diabetic retinopathy screening (WA)	1 paper: Aboriginal controlled health information network for GPs
Harris <i>et al.</i> <sup>47</sup>	Paediatrics	Telepaediatric clinical forums – mobile and wireless videoconference systems (QLD)	Nil
McCull <sup>29</sup>	Dermatology	Interactive educational website – Dermconsult (national)	Tele-Dermatology in Queensland
Chan <i>et al.</i> <sup>48</sup>	Surgery	Tele-education – fetoscopic laser surgery (QLD)	Nil
Morris <sup>49</sup>	Obstetrics and gynaecology	Improve fetal monitoring interpretation (SA)	1-Case discussion-fetal diagnosis of abnormalities (SA)

Another avenue for professional development is through web-based education such as that provided by the Australian College of Rural and Remote Medicine's Rural and Remote Education Online (see www.rrmeo.com, accessed 27 November 2008). This service offers online continuing education modules that can provide Continuing Professional Education, with such services shown to reduce travel and costs for rural and remote health professionals.<sup>22</sup> Furthermore, the increased ease of access and

networking with online professional development activities has made a positive contribution to the perception of rural practice<sup>27</sup> and achieved a reduction in professional isolation.<sup>22,27</sup>

Telehealth promotes enhanced local service provision, a more rapid specialist clinical assessment, reinforcement of the local health professionals' clinical assessments and increased support from and access to specialists and their resources. An example is the addition of a videoconference to a 6-monthly visit by a team of

**Box 1. Benefits to rural patients and rural health professionals**

## Benefits to rural patients

1. Local access to specialist health care: Clinical management in the local area can result in lower costs (travel, accommodation, childcare, food, parking), less inconvenience (time away from work, home, family), minimised social dislocation of families and for psychiatric patients reduced impact on their quality of life.
2. Improved access to services: Earlier assessment and treatment can occur through the rapid provision of clinical opinion from the easy local access to specialists; reduced admissions; more timely transfers; patients better resuscitated for their transfer; shorter inpatient stays minimising time away from home.
3. Improved quality of clinical service: Better educated and trained rural health professionals through their access to telehealth; local clinicians supported by specialists; improved continuity of care; improved coordination, review and management for patients transferred.

## Benefits to rural health professionals

1. Local access to continuing education and professional development:
  - Increased access to education and training through this cost- and time-effective alternative
  - opportunities to obtain CPD credit without the need to travel
  - access to otherwise unavailable professional development experiences (grand rounds; meetings)
2. Enhanced local service provision:
  - increased service provision
  - more rapid provision of specialist clinical assessment
  - useful reinforcement of clinical assessments
  - increased support from and access to specialists and their resources
3. Experiential learning, networking and collaboration:
  - the learning that occurs when the local health professional is present for the specialist consultation; each session provides a clinical tutorial
  - increased skills or knowledge through formal and informal presentations, multi-disciplinary clinical case discussions, peer review, case conferences and special interest group meetings
  - alleviating professional isolation by improved access to and networking improved communication through closer collaboration between local health professionals and specialists
  - improved skill and confidence with information technology

paediatric sub-specialists from Adelaide to the Northern Territory. This extra service provided an early response to patient issues, resulted in fewer transfers and assisted local practitioners with clinical management by providing direct access to a team of paediatric sub-specialists at one time.<sup>28</sup>

An example of the reinforcement of clinical assessments by local health professionals comes from dermatology. A rural GP is unlikely to have the extensive experience necessary to diagnose one of a possible 2000 dermatology conditions (p. 33).<sup>29</sup> However by store-and-forward techniques an urban dermatologist can complement a GPs assessment and ultimately reinforce or improve the clinical diagnosis. In this way professional development that may include more interactive discussions about patients with urban professionals, can result in increased confidence in management, and more learning opportunities.<sup>30</sup>

The greatest potential for support from and access to specialists and their resources is when telehealth is integrated into routine care with an on-going relationship between the rural health professional and urban specialist.<sup>24,25</sup> In addition, experiential learning in telemedicine occurs when a rural health professional has contact with urban based specialists. An example of this is with the use of videoconferencing where the patient, rural GP and specialist are all present and the GP may observe the specialist working. The literature suggests that the discipline of psychiatry has made the greatest use of video-conferencing in Australia developing its own networks in Queensland,<sup>21,31</sup> South Australia<sup>8,21</sup> and Victoria.<sup>16</sup>

*Reported benefits to participating hospitals*

Telehealth used in a hospital setting requires greater organisation and as such may ensure more appropriate patient admissions and

potentially reduced length of stay or better patient outcomes.<sup>14</sup> Furthermore, reduced patient travel claims and patient transfer expenses are of particular importance for patients in larger states where distances to access specialist care are greatest.<sup>32</sup> Likewise reduced travel time, expense and time away from their urban practice is also a benefit to specialists.<sup>33</sup> These two factors combine (potentially) to reduce the cost of a hospital providing a service. However the high cost of videoconferencing equipment<sup>32</sup> may negate this to a degree, but the considerably lower cost of store-and-forward technologies<sup>34</sup> would not. Therefore the greatest benefits for institutions such as hospitals are the potential financial savings due to a reduction in travel costs, the ability to provide services directly to patients living in areas beyond the usual service boundaries of care and the better quality of service provided.

*Reported benefits to society*

Improving the health of rural Australians who are known to suffer a poorer health status than urban Australians,<sup>35</sup> would be a significant societal benefit from telehealth. As previously reported there are mixed findings on the clinical benefits of telemedicine in the international literature, but clinical outcomes were not a focus of this review. A potential societal benefit of telehealth is improved productivity due to less time away from work primarily because of reduced travel.<sup>33</sup> In addition there are the financial benefits to rural communities when patients remain in their community.<sup>14</sup> The local availability of professional education through telehealth technology is one strategy that could enhance rural health workforce recruitment and retention<sup>36</sup> and commentators reinforce this idea.<sup>27,33</sup>

## Conclusions

Despite telehealth being reported to be under-utilised in Australia,<sup>13</sup> this review has highlighted how Australians living and working in rural and remote locations are reported to have benefited from telehealth. The improved access, quality of care and professional development reported in this review suggest movement towards the goal of improving the health status of rural Australians. Further research such as a systematic review of clinical outcomes would be informative here.

The potential for hospitals to achieve cost-savings through the use of telehealth, combined with the ability to provide a better quality service and a greater breadth of services is noteworthy. Should this support the improved health of rural Australians, it would be a valuable contribution.

Although rural health professionals are reported to benefit from telehealth, perhaps the greatest albeit indirect benefit to rural patients is through the up-skilling of rural health professionals via the professional development and experiential learning received. There is some evidence to suggest that the benefits of telehealth for health professionals play a role in rural health workforce recruitment and retention. This is because some of the benefits reported for rural health professionals are usually only available to rural and remote health professionals. An example being the experiential learning acquired through observing a specialist during video-conferencing – a valuable educational opportunity for a remote General Practitioner, with the additional knowledge able to be applied immediately to everyday practice.

This review indicates that the increased use of telehealth for clinical services and professional development may be a single strategy that can have a positive impact on two significant ongoing issues for rural Australia: the poorer health status of rural Australians and the crisis in the rural health workforce.

## Competing interests

There are no conflicts of interest for either author.

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