



# Telehealth: experience of the first 120 consultations delivered from a new Refugee Telehealth clinic

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## Key words

telehealth, telemedicine, refugee, immigrant.

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## Abstract

**Background:** In 2011, the Australian Government introduced Medicare item numbers for telehealth consultations. This is a rapidly expanding method of healthcare provision.

**Aims:** We assessed the demographic and disease profile of refugee patients attending a new telehealth clinic, and calculated the patient travel avoided. We examined technical challenges and assessed the performance of two videoconferencing solutions using different bandwidth and latencies.

**Methods:** We audited the first 120 patients attending the telehealth clinic. During consultations, the patient was with the general practitioner (GP) and linked by internet videoconference using VIDYO, GoToMeeting or Skype, to the specialist at a tertiary referral hospital. Travel avoided was calculated and technical problems were assessed by the participating specialist. Bandwidth and latency variations were examined within a university broadband testing facility.

**Results:** The two most frequently managed conditions were hepatitis C and latent tuberculosis. Twenty-nine different GP were included and 42 consultations required an interpreter. Nearly 500 km of travel and 127 kg of CO<sub>2</sub> production was avoided per consultation. Technical issues were faced in 25% of consultations, most frequently sound problems and connections dropping out. A bandwidth of at least 512 kbps and latency of no more than 300 ms was necessary to conduct an adequate multipoint videoconference.

**Conclusions:** Telehealth using videoconferencing adds a new component to care of refugee and immigrant patients settling in regional areas. Telehealth will be improved by changes to improve simplicity and standardisation of videoconferencing, but requires ongoing Medicare funding to allow sufficient administrative support.

## Introduction

Nearly one-third (30%) of the Australian population live in areas other than major cities<sup>1</sup> and many require access to specialist healthcare. As the delivery of healthcare becomes more specialised, the mismatch between the location of specialists and the population requiring services is increasing. This is particularly evident for the approximately 20 000 refugees that settle each year in Australia,<sup>2</sup> of whom half require specialist consultation.<sup>3</sup> The use of telehealth (consultation through video-conference in which the patient and specialist are in separate locations) is an important modality in the delivery of specialist care to these patients.<sup>4</sup>

Patient convenience is much improved, and reduced travel with telehealth leads to very considerable cost

savings, both in the cost of the travel and the opportunity costs of other activities that are not performed while attending clinic.<sup>5,6</sup> Until recently, telehealth was mainly used within the public sector, especially in Queensland.<sup>7</sup> In 2011, the Australian Government introduced Medicare funding for clinical consultations between specialists and patients through telehealth,<sup>8</sup> either at a general practitioner's (GP) practice, from home or from an aged care facility. This led to a large increase in the provision of telehealth services in both the public and private sectors, and in the first 2 years of the scheme, nearly 100 000 telehealth consultations were reimbursed through Medicare.<sup>9</sup>

We present our experience of the first 120 clinical consultations delivered by a new infectious diseases telehealth clinic at a tertiary hospital and patients in the regional and rural Victoria, many of whom were recent refugee arrivals. We assess the benefits and challenges, and make recommendations for improving the utility and

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efficiency of videoconferencing in medicine. We calculate the reduction in carbon output that results from reduced patient travel.

## Methods

The Victorian Infectious Diseases Service based at the Royal Melbourne Hospital (RMH) is a tertiary referral infectious diseases service providing inpatient and outpatient care for a broad range of patients within the subspecialty of infectious diseases. A new outpatient telehealth clinic was commenced in early 2012 to complement the current six outpatient clinics. Referrals to the clinic were from GP, and also from other RMH doctors requiring follow up of patients residing in regional areas.

During the telehealth consultation, the patient sat at the GP practice with their GP and/or a practice nurse. They communicated with the specialist through videoconference over an internet connection. Low cost internet videoconferencing systems were used, including VIDYO™ (VIDYO Inc., Hackensack, NJ, USA), GoToMeeting™ (Citrix, Santa Clara, CA, USA) and Skype™ (Skype Technologies S.A., Luxembourg City, Luxembourg). We used Logitech™ C910 cameras (Logitech International S.A., Lausanne, Switzerland), hospital desktop computers with an XGA screen (extended graphics array screen with 1024 × 768 pixels) and a ClearOne™ Chat 50 external speaker microphone (ClearOne Salt Lake City, UT, USA). Hardware at the GP's end was varied, and although guidelines were provided, including using Windows (Microsoft, Redmond WA, USA) or Mac (Apple Inc., Cupertino, CA, USA) OS/X operating systems, there were no fixed hardware requirements. Professional interpreters were used when necessary, and accessed in various ways including onsite, through telephone and through videoconference (three-way videoconference with patient, specialist and interpreter at separate locations).

Patient demographic information was stored in a de-identified Excel spreadsheet (Microsoft™) kept on a password-protected computer for the purposes of this audit. To provide future advice to GP regarding suitable bandwidth and latency for multipoint videoconferencing, we conducted a trial at the University of Melbourne broadband testing facility (Institute for a Broadband-Enabled Society) to assess bandwidths of between 128 kbps and 5 Mbps at a latency of 50 milliseconds (ms). Latency of between 50 ms and 1000 ms were also trialled at fixed bandwidth of 1 Mbps. Clinicians and researchers read medical scripts and independently rated both the sound and picture quality. A 5-point rating scale was used with a score of 3 or above indicating that the parameter was considered at least adequate for a clinical consulta-

tion. The project was approved by the Melbourne Health Human Research Ethics Committee.

## Results

One hundred and twenty telehealth consultations were conducted between May 2012 and June 2013. Consultations included initial and follow-up assessments, and patients were seen either in combination with a review in-person, or entirely through telehealth. Twenty-nine different GP conducted at least one telehealth consultation with their patient and a specialist. During 76% (91/119) of the consultations, the GP was with the patient. In the other consultations, a practice nurse was present.

The median age of the patients was 39 years, and 63% were male (75/119) (Table 1).

A total of 145 conditions was managed during the 120 consultations.

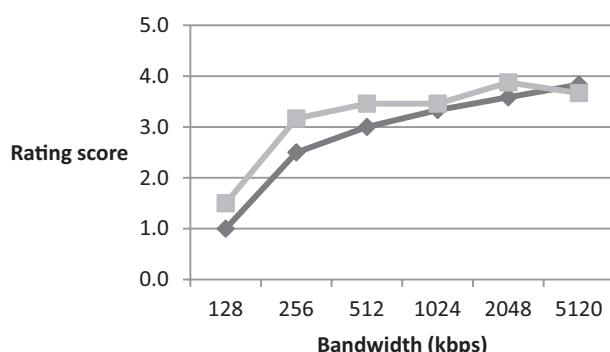
The most frequently managed conditions were hepatitis C (59 consultations) and latent tuberculosis (42). Other conditions regularly managed included helminthic infections (10 consultations), human immunodeficiency virus (8), eosinophilia (7) and hepatitis B (6). Interpreters were required for 42 consultations. Most frequently, this was a professional interpreter accessed over the phone (15 consultations), through videoconference (10) or onsite (7). Family members interpreted for eight consultations and the GP for three. The most frequently used languages were Nepali (18 consultations) and three languages from Burma (Burmese, Haka Chin or Karen, for 18 consultations).

Software choice was based on GP and specialist preference, Skype was used on 59 occasions, VIDYO on 42 occasions and GoToMeeting on 19 occasions.

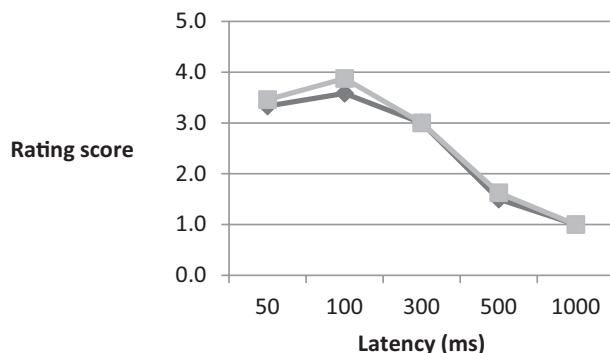
Technical difficulties as rated by the specialist were experienced in 25% (30/118) of consultations, although this significantly improved with experience, and in the second 60 consultations, information technology (IT) was rated an issue in only 8% (5/60) of consultations. Professional IT support was available onsite; however, the professional IT was not always immediately accessible. The most frequent IT issues were problems with lack of adequate sound quality, echo, the connection dropping out and difficulties downloading software at the GP's end.

Inadequate sound quality and echo problems were resolved by using a separate phone line if necessary. Loss of connectivity was most frequently caused by lack of adequate available bandwidth. Technical issues at the GP's end were improved when a connection was scheduled with new practices prior to the patient being present to troubleshoot potential problems.

The median distance of patient travel saved for a return trip (using road distance from GP practice to tertiary



**Figure 1** Rated quality of a multipoint videoconference at varying bandwidths (score of 3 or more represents an adequate consultation). (—●—), Picture quality; (—■—), sound quality.



**Figure 2** Rated quality of a multipoint videoconference at varying latencies. (—●—), Picture quality; (—■—), sound quality.

hospital) was 494 km, and a total of over 54 000 km of travel was avoided. It is calculated that 15 200 kg of CO<sub>2</sub> (127 kg of CO<sub>2</sub> per return trip)<sup>10–12</sup> was not released into the atmosphere (assuming all kilometres travelled were by car and for the purpose of the consultation only), based on standard figures from the Australian Greenhouse Office, the Australian Bureau of Statistics and the 'carbon neutral' carbon calculator. This also represented a large time and cost saving for the patient.

The results of the trial of varying bandwidth and latency are shown in Figures 1 and 2. The trial was completed successfully on two (VIDYO and Skype) of the three software products used. We demonstrated that a bandwidth of below 512 kbps was inadequate for picture quality and below 256 kbps inadequate for sound quality for multipoint videoconference. A maximum latency of 300 ms was necessary for an adequate multipoint videoconference; above this latency, both sound and picture quality were rated as inadequate.

**Table 1** Demographic and summary information

Patient and consultation variables	
Median age (years)	39 (IQR 32–49)
Number of males	75
Number of females	44
Consultations with GP with patient	91
GP who conducted at least one consultation	29
Consultations with practice nurse with patient	28
Median return distance from GP practice to tertiary hospital (km)	494 (IQR 188–648)

GP, general practitioner; IQR, interquartile range.

## Discussion

We have demonstrated that a successful telehealth clinic can be developed within a tertiary hospital for the provision of infectious diseases clinical care to complex patients attending GP clinics throughout Victoria. Although technical issues were encountered initially, these were largely able to be resolved and significant clinical and patient benefits were realised. We were able to manage a wide range of complex medical conditions, and demonstrated that the inclusion of interpreters was feasible.

We found that telehealth can be used for follow up of discharged hospital inpatients, and regularly scheduled outpatient appointments. Mostly telehealth consultations were in addition to in-person consultations. Some patients however were able to be managed solely through telehealth without the need for in-person review. Those consultations requiring limited clinical examination and a focus on discussion of symptoms, results and prognosis, were particularly well suited to telehealth.

As medical consultations contain an inherent level of unpredictability, it is necessary to be able to arrange to see the patient in-person should unexpected medical complications develop, or the internet connection be inadequate for the required clinical interaction.

The inclusion of an interpreter into a telehealth consultation allows for improved healthcare access for vulnerable groups in the community such as refugees. Accessing onsite interpreters in rural areas is very difficult,<sup>13</sup> and we have demonstrated that the interpreter can sit with the specialist at the central location or with the GP and provide effective interpreting for the consultation.

Our clinic uses low cost internet videoconferencing offering much greater potential savings than telehealth clinical care delivered through expensive hardware-based systems.<sup>5</sup> As internet speed improves, this will become a possibility at most homes and GP practices in Australia.

The inclusion of the GP in the consultation had a direct benefit in having a clear and immediate transfer of

information between specialist and GP, and a potential opportunity for the education of GPs. Including a GP in the consultation increased cost, and made scheduling more complex.

The reduction in carbon output is an important consideration and the high levels of carbon output associated with healthcare delivery have been recognised in other studies both in Australia<sup>14</sup> and internationally.<sup>15</sup>

We confirmed the findings of others that adequate internet bandwidth (speed) is necessary for videoconferencing,<sup>16</sup> particularly with complex patients and if a multipoint consultation is to occur.

The requirement for a bandwidth of at least 512 kps for a multipoint consultation is higher than some recommendations for two-point videoconferencing that have considered a bandwidth of 256 kps adequate.<sup>17</sup> Our demonstration of the need for both upload and download speeds of at least 512 kps to have adequate picture and sound quality reinforces the considerable benefit of improving internet speeds to homes and businesses throughout Australia. Many homes and smaller businesses in Australia (including general practices) use an ADSL2+ (Asymmetric Digital Subscriber Line) internet connection that will generally have a peak bandwidth for download well in excess of 512 kps. However, the upload bandwidth (speed) may at times fall below this.<sup>18</sup> Wireless connections can also be used; however, we would recommend that both upload and download speeds are adequate to ensure a satisfactory consultation. Reliability and latency can also be problematic with an ADSL2+ connection. It is expected that with an Australian fibre optic broadband network both upload and download bandwidths would be significantly higher than this, even without a fibre optic connection to the actual premise.<sup>19</sup>

While telehealth has many advantages, the difficulties should not be underestimated. The high number of technical issues in the initial part of this study could be a significant barrier to uptake. Many busy clinicians would not persist with telehealth if IT issues were so frequently encountered.<sup>20</sup> Consideration should be given to a period of formal training for clinicians and ideally the availability of immediately accessible onsite IT support. The lack of interconnectedness between different software and the lack of an accepted and widely used standard videoconferencing system means clinicians are required to use different software depending on whom they are connecting to. This may be a barrier to wider provision of quality telehealth services. Simplicity and reliability are crucial to success, and until making a videoconference call is as seamless and easy as making a telephone call, full integration into routine clinical services may not occur.

The difficulty of organising an appointment at a time that is suitable for specialist, GP and patient and then to

have all arrive in a timely manner should not be underestimated. The inclusion of an interpreter can then introduce a further layer of complexity. Internationally, the issue of scheduling has been successfully addressed using a central agency responsible for all telehealth bookings.<sup>21</sup> Furthermore, the requirement to have a patient sign a Medicare assignment form rather than the acceptance of a verbal agreement added additional administrative workload.

## Conclusion

Overall, we found that telehealth enhances access to tertiary hospital-based specialist care. The availability of much faster and more reliable internet, particularly faster upload speeds, has the potential to turn most computers into high-quality videoconference units. Establishment of a telehealth service is achievable by following accepted guidelines and clinicians, and administrators should consider this development a component of routine care. This should be pursued as a way to improve healthcare access for all in regional areas including refugees, one of the most vulnerable groups in Australian society. Although IT issues can be problematic, they can be resolved and a regular telehealth clinic has proven a successful addition to our infectious diseases service.

## Key recommendations and conclusions

- 1** Provide resources for administrative support for telehealth, either as a central service or at individual locations.
- 2** Use telehealth as one component of overall patient care and ensure the opportunity for in-person review is always available.
- 3** Move towards an accepted standard system for videoconferencing.
- 4** Ensure a consistent bandwidth of at least 512 kbps, for upload and download, with a latency of 300 ms or less to allow adequate sound and picture quality for multipoint videoconferencing.
- 5** Continued Medicare item number support for telehealth to account for the increased administrative complexity.
- 6** Encourage software (and hardware) vendors to improve the ease of use for clinicians, until videoconferencing is as simple as using the telephone.

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