

Optimizing patient referrals to dental consultants: Implication of teledentistry in rural settings

Mohamed Estai, Estie Kruger, Marc Tennant

International Research Collaborative, Oral Health and Equity, Department of Anatomy, Physiology and Human Biology, University of Western Australia, Australia

EDITORIAL

Please cite this paper as: Estai M, Kruger E, Tennant M. Optimizing patient referrals to dental consultants: Implication of teledentistry in rural settings. AMJ 2016;9(7):249–252. <http://doi.org/10.21767/AMJ.2016.2696>

Corresponding Author:

Dr Estie Kruger

International Research Collaborative-Oral Health and Equity
Department of Anatomy, Physiology and Human Biology
University of Western Australia, Crawley, WA 6009
Email: estie.kruger@uwa.edu.au

The uneven distribution of dental practitioners (particularly consultants – in Australia commonly called specialists) in Australia creates a barrier to accessing consultant level dental care. This maldistribution often results in the isolation of general dental practitioners (GDPs) practising in rural/remote settings, and the consequent lack of easy access to a second expert opinion from dental consultants. It then becomes challenging for GDP's to weigh up cases that need consultant advice. This, at times, can contribute to under-referral or unselective referral of patients that require consultant advice, furthering the burdens on rural residents through additional travel and increased waiting times.

In Australia, distances to the nearest referral centre continue to be a matter of concern for many rural and remote residents. The traditional paper-based referral pathway has historically been the key method for sharing clinical information between GDPs and specialists; however, there is a growing risk that the referral letters may lack essential clinical information (photos, radiographs or pathology results). The problem with the traditional paper-based referral is not about the quality of the referral letter, but the inability of this method to provide timely information to specialists and

provide digital data. This could lead to inappropriate referrals of cases and missing cases which require referrals. Inadequate referral letters are often associated with delayed patient assessment and contribute to delayed diagnosis and treatment of even sinister lesions (e.g., oral cancer), and less favourable outcomes for the patient.¹

In Australia patients don't normally have direct access to specialist care, but near universally on a referral basis from a GDP. In addition, the majority of specialist dentists in Australia are working in the private sector (in major urban centres) which can add a layer of complexity, and cost, for patients including travelling and loss of productivity. In the traditional referral pathway, a patient is referred to a specialist accompanied by a referral letter. The additional digital information (clinical photographs and radiographs), which typically is not available through the traditional referral pathway, may impact not only diagnostic validity, but also clinical outcomes. Many referred cases can be assessed through good radiographs photographs and/or pathology test and a provisional treatment plan can be provided without the need for a hospital visit. In view of these limitations in traditional paper-based referral pathways and the absence of a central oral health record that connect GDPs to specialists, developing alternative referral models for managing and prioritising treatment for patients is an important opportunity.

Alternatively, dental consultants can provide consultation through the utilization of teledentistry technology. The use of teledentistry, (often seen as a sub-specialty of telehealth), has rapidly grown and proven beneficial recently.² Consultation through teledentistry can take on two modes, real-time and store-and-forward. Real-time (synchronous) consultation involves a videoconferencing between a patient and his/her practitioner at a remote site, as well as another practitioner (often a consultant) at a hub site simultaneously. The real-time application is more useful for continuing education and consultation

between GDPs and consultants.^{3,4} With the majority of consultants working in the private-sector, in the long-term, the use of the real-time modality in consultation can be inconvenient, time-consuming and costly, as compared to the store-and-forward consultation. In store-and-forward (asynchronous) consultation, clinical data (radiography, photographs and personal information) is stored, before being forwarded electronically for a consultant advice. Available evidence indicates that the store-and-forward application has the potential to prioritise new patient appointments and facilitate patient referrals particularly in certain dentistry disciplines such as orthodontics^{4,5}, oral surgery⁶ and oral medicine.^{7,8} The practices of store-and-forward teledentistry have also proven to be more cost-saving and efficient compared to real-time and in-person consultation.⁹ Taking advantage of the information and communication technology and increasingly widespread global connectivity, as well as access to low-cost, secure cloud storage, has the potential to improve referrals and make oral care services more accessible. A number of asynchronous-based referral systems have been developed in other healthcare disciplines in particular teledermatology.^{10–12} These resulted in a reduction in the number of patient referrals and waiting time as well as improved accuracy of diagnosis and treatment outcomes.

Our initial efforts lead to the development of a cloud-based server, “Remote-i”, based on store-and-forward technology, to work as a platform for storage and management of databases.^{13,14} This system enables uploading and storing images and patient information online either directly from a smartphone or computer. Also, the system is capable of image acquisition, entry, storage and retrieval of data through a secured system. Users can access the database using a web-based data and image-viewing app built upon the Remote-i system. GDP can upload patient information along with x-ray images and intraoral photographs to the remote-i for later evaluation by a consultant at a distance. In the teledentistry-based referral model, patients do not need to travel to visit a consultant, as dental specialists can access the database in their convenient time and assess records at a distance to determine whether a case needs a referral to a specialist or can be treated by a locally-based GDP. To ensure data privacy, patients’ data stored on the server are anonymous and unidentifiable, the record for each patient has an ID that corresponds to the hospital/clinic ID, and all users use username and password to access the database. The proposed tele-referral system design process is shown in Figure 1.

Many dental consultants favour direct visual examination of patients to establish a valid diagnostic decision. However, due

to the inability of consultants to travel to examine patients in their hometown, a teledentistry-based referral system could provide an opportunity for consultants to identify those for which referral is unnecessary or could be delayed, thus help in a reduction in the number of referrals to specialists. In this way, patients with potentially malignant lesions, or those requiring urgent intervention can be prioritized for assessment by a consultant.¹⁵ This in time, could result in a reduction in time from referral date to the date treatment commenced, thus providing a quick pathway to a consultant. Thus, teledentistry has implications for validation of referrals (and thus by corollary the optimization of waiting times based on risk). From dentists’ perspective, teledentistry has the potential to reduce inappropriate referrals, in certain disciplines like orthodontics, oral medicine, oral surgery and paediatric dentistry, through providing a second opinion and timely information to GDPs for better decision-making and supporting locally-based treatment. Teledentistry could increase the integration of remote dental experts by reducing dental consultants’ need for travel and facilitate interactivity (consultations and sharing of patient health information) between rural practitioners and dental consultants. Reductions in travel time would also result in an increased availability of the dental consultant services at their residence clinics. In the long term, the Remote-i system can be used as a starting point for establishing a wider electronic oral health record. It would also allow dental practitioners to incorporate dentistry into the larger health-care delivery system by enhancing collaboration with other healthcare disciplines.

Telehealth has the capability to connect dental experts anywhere in the world. This is particularly important to the sparsely populated and isolated communities that do not have access to specialist dental care. This technology is particularly attractive because almost all dental practices (in developed countries) are now equipped with a computer, digital camera, radiography, and internet access, even in underserved regions. From a practical approach, it seems reasonable to use technical equipment that is readily available in dental practices, which automatically provide the infrastructure for telehealth solutions. Store-and-forward telehealth can be incorporated into the oral health system to create an efficient and reliable screening system to optimize referrals and prioritize patients’ assessments, and thus offers an alternative (or, at least, an augmentation) to the traditional referral pathway. Historically, telehealth services have been underutilized due to privacy

vulnerability, costs and lack of clear guidelines to regulate teledentistry practice.¹⁶ It is expected that as the technology continues to advance, these issues will not be critical in the near future. Further research is needed to evaluate the effectiveness of the proposed system in improving referrals and prioritizing patients' assessments.

References

1. McLeod NMH, Saeed NR, Ali EA. Oral cancer: delays in referral and diagnosis persist. *Br Dent J.* 2005; 198: 681–684.
2. Estai M, Kanagasingam Y, Huang B, et al. The efficacy of remote screening for dental caries by mid-level dental providers using a mobile teledentistry model. *Community Dent Oral Epidemiol.* 2016: doi: 10.1111/cdoe.12232
3. Berndt J, Leone P, King G. Using teledentistry to provide interceptive orthodontic services to disadvantaged children. *Am J Orthod Dentofacial Orthop.* 2008; 134: 700–706.
4. Stephens C, Cook J, Mullings C. Orthodontic referrals via teledent Southwast. *Dent Clin North Am.* 2002; 46: 507–520.
5. Mandall NA, O'Brien KD, Brady J, et al. Teledentistry for screening new patient orthodontic referrals. Part 1: A randomised controlled trial. *Br Dent J.* 2005; 199: 659–662.
6. Herce J, Lozano R, Salazar CI, et al. Management of impacted third molars based on telemedicine: a pilot study. *J Oral Maxillofac Surg.* 2011; 69: 471–475.
7. Salazar-Fernandez CI, Herce J, Garcia-Palma A, et al. Telemedicine as an effective tool for the management of temporomandibular joint disorders. *J Oral Maxillofac Surg.* 2012; 70: 295–301.
8. Bradley M, Black P, Noble S, Thompson R, Lamey PJ. Application of teledentistry in oral medicine in a community dental service, N. Ireland. *Br Dent J.* 2010; 209: 399–404.
9. Mariño R, Tonmukayakul U, Manton D, et al. Cost-analysis of teledentistry in residential aged care facilities. *J Telemed Telecare.* 2015. doi: 10.1177/1357633X15608991.
10. Moreno-Ramirez D, Ferrandiz L, Nieto-Garcia A, et al. Store-and-forward teledermatology in skin cancer triage: experience and evaluation of 2009 teleconsultations. *Arch Dermatol.* 2007; 143: 479–483.
11. McGoey ST, Oakley A, Rademaker M. Waikato teledermatology: a pilot project for improving access in New Zealand. *J Telemed Telecare.* 2015; 21: 414–419.
12. Armstrong AW, Sanders C, Farbstein AD, et al. Evaluation and comparison of store-and-forward teledermatology applications. *Telemed J E Health.* 2010; 16: 424–438.
13. Estai M, Kanagasingam Y, Xiao D, et al. End-user acceptance of a cloud-based teledentistry system and Android phone app for remote screening for oral diseases. *J Telemed Telecare.* 2015. doi: 10.1177/1357633X15621847
14. Estai M, Kanagasingam Y, Xiao D, et al. A proof-of-concept evaluation of a cloud-based store-and-forward telemedicine app for screening for oral diseases. *J Telemed Telecare.* 2015. doi: 10.1177/1357633X15604554.
15. Bradley M, Black P, Noble S, et al. Application of teledentistry in oral medicine in a community dental service, N. Ireland. *Br Dent J.* 2010; 209: 399–404.
16. Estai M, Kruger E, Tennant M. Perceptions of Australian dental practitioners about using telemedicine in dental practice. *Br Dent J.* 2016; 220: 25–29.

PEER REVIEW

Peer reviewed.

CONFLICTS OF INTEREST

The authors declare that they have no competing interests.

FUNDING

None

Figure 1: Flow diagram of the proposed tele-referral system

