

Waikato Teledermatology: A pilot project for improving access in New Zealand

Suzanne T McGoey

Department of Dermatology, Wayne State University – School of Medicine, MI, USA

Amanda Oakley

Hon A/Prof, Waikato Clinical Campus, University of Auckland.

Department of Dermatology, Waikato Hospital, New Zealand

Marius Rademaker

Hon A/Prof, Waikato Clinical Campus, University of Auckland.

Department of Dermatology, Waikato Hospital, New Zealand

**Corresponding author**

A/Prof Amanda Oakley, Department of Dermatology, Level 1 Meade Clinical Centre, Waikato Hospital, Private Bag 3200, Hamilton New Zealand.

Mobile phone number: +64 27 271-6985

Email: [Amanda.oakley@waikatodhb.health.nz](mailto:Amanda.oakley@waikatodhb.health.nz)

## **Summary**

### **Introduction**

Teledermatology can improve access to specialist dermatological advice. We describe a retrospective review of the first 12 months of Waikato Teledermatology (WT), a low-cost, secure, website-based, store-and-forward teledermatology network using the Collegium Telemedicus platform.

### **Methods**

We determined specialist response time, referral metrics, patient diagnosis and progress reports from the network's database. The programme's value was evaluated by post-pilot online surveys of referrers and specialist dermatologists.

### **Results**

WT was used by 31 referring doctors for 306 consultations with 4 dermatologists between July 2013 and June 2014. Mean and median specialist response time was 2.07 hours [range: 0.13–5.64 hours]. The researchers categorised the referrals as tumours (56.8%) and rashes (43.2%), including inflammatory dermatoses (51.9%), infection (18.1%), uncertain (16.5%), miscellaneous (7.5%), and of environmental origin (6%). Thirty tumours were biopsied, including nine melanomas and three basal cell carcinomas.

A total of 158 progress reports and 35 survey responses were received. Reported advantages included decreased delay, improved accuracy of diagnosis and treatment compared to that made without specialist input, decreased unnecessary procedures such as biopsies of undiagnosed conditions, and increased appropriate referrals for face-to-face assessment, thus leading to cost savings for the patient and the health care system. The major disadvantages were the time burden for clinicians to complete consultations, the lack of integration with the patients' usual electronic medical record and absence of funding.

### **Discussion**

WT proved an effective and acceptable approach to improving patient access to dermatologic services.

### **Keywords**

Teledermatology, Telemedicine, Telehealth

## **Introduction**

The healthcare of the New Zealand population (4.5 million people) is provided through a mix of public and private healthcare services. Public dermatology is largely provided at a secondary/tertiary level within regional public hospitals, with all patients requiring referral from their General Practitioner (GP) or other medical practitioner. There is a very significant undersupply of dermatologists, with only 17 full time equivalent (FTE) dermatologists working in the public system. The Waikato region of New Zealand has a population of 413,000 but only 2.4 FTE public dermatologists. The ideal dermatologist to patient ratio is 1:50,000<sup>1</sup> thus an access gap exists in which patients with skin diseases often do not have timely access to an appropriate specialist.

While public hospital care is free to the patient, access is rationed to those with greatest need during an acute crisis or suffering from uncontrolled chronic skin disease. The routine wait-time for an initial appointment is four months (New Zealand Ministry of Health requirement).

In the private sector, wait times for dermatology appointments vary between one and six months (personal communication). Access to these fee-for-service visits is cost limited as only one third of the population carries optional health insurance.

Most patients with skin disorders in New Zealand consult general practitioners, who may have difficulty reaching a diagnosis and/or determining appropriate treatment. Accurate treatment is diagnosis-dependant but non-dermatologists are less accurate in diagnosing skin diseases than dermatologists.<sup>2</sup> GPs demonstrate only a 57% diagnostic concordance when compared to dermatologists<sup>3</sup> and yet provide over 85% of dermatological consultations. As a consequence, general practitioners often ask advice via letter, telephone or email.

Teledermatology has the potential to provide faster access to dermatologists with earlier accurate diagnosis and treatment. We aimed to demonstrate the feasibility of a secure website-based store-and-forward teledermatology network for Waikato GPs to seek timely advice from specialist dermatologists.

## **Methods**

### *Waikato Teledermatology*

A teledermatology network, Waikato Teledermatology (WT), was established in 2013, and its usefulness assessed after 12 months by retrospective review. The was a non-interventional service review with non-identifiable data, so New Zealand Health and Disability Ethics Committee approval was not required.

Both dermatologist and GP participation was voluntary and services were free with no reimbursement provided. GPs were initially invited to participate if they had previously

requested email advice from dermatologists. With minimal promotion, additional GPs were able to join the network.

### *Collegium Telemedicus*

Consultations were sent via the Collegium Telemedicus (CT) platform (<https://collegiumtelemedicus.org/>). CT is an informal organization set up by an International Steering Group. It was originally intended to assist people who wish to operate telemedicine networks to deliver health care in remote or low-resource settings. CT eliminates the need for development of telemedicine software particularly when this technical expertise may be lacking among clinicians. CT provides a template for telemedicine networks to begin immediately, with no start up costs. The program can be accessed using any web browser and provides a secure SSL (Secure Sockets Layer) connection and hardware firewall with restricted ports. Daily backups are offsite using cloud storage. Communication between referring clinicians and specialists is possible via a secure messaging system that eliminates the need for the less secure option of email. The secure system sends an email to inform the referrer or specialist that there is a message waiting though no clinical information is exchanged via email. Delay in specialist response leads to the referral being redirected to a second specialist. Bidirectional encryption, storage on a secure server, and access through an SSL connection all provide easy access, secure storage, and an audit trail.

Potential participating networks must first identify a guarantor and a coordinator. The guarantor is responsible for maintaining the conditions of use among network participants. The coordinator runs the network including the set up of accounts for referring clinicians and specialists as well as case allocation. A prospectus with explanation of network details must be submitted followed by registration and acceptance of conditions of use. Ultimately each network can tailor the platform to their individual needs.<sup>4</sup>

### *Consultations*

GPs were provided with information about CT requirements and referral guidelines including appropriate images, accompanying clinical information, and additional supporting documents. All participants were assigned a login requiring a password. GPs uploaded images and accompanying documents with a text field for history and additional questions. The network coordinator then assigned the cases to one of four experienced dermatologists. The use of a coordinator allowed consults to be actively targeted to an appropriate specialist as well as cater for specialist unavailability. Dermatologists responded with recommendations for diagnosis and treatment.

Usefulness and value of the teledermatology system were measured by online post-pilot surveys compiled by WT for participating dermatologists and referring GPs. Information was obtained about methods of completing consultations and storage of information, advantages and disadvantages of the system, effects on patient care, in addition to suggestions for further development. CT also sent additional case progress reports

evaluating process measures, helpful aspects of consultations, subjective improvement in patient outcome, perceived educational benefit, and cost savings.

## Results

### *Referral metrics*

The pilot project was run over a 12-month time period. Thirty-one GPs sent in at least one referral with 80% of cases referred by ten doctors. A further 35 GPs signed up but had not yet referred any patients. Three hundred and nine patients were referred, with a median age of 43 years (range of 6 weeks to 92 years) and 57% female patients (Table 1). The median allocation delay was 2.1 hours. The median time to first consultant response was 2.07 hours (range: 0.13–5.64 hours). 43.2% of consultations were for rashes whereas 56.8% were for tumours. The subgroups for rashes included inflammatory dermatoses (51.9%), infection (18.1%), uncertain (16.5%), miscellaneous (7.5%), and environmental (6%). Thirty-nine biopsies were requested by the dermatologist and performed by the GPs (mostly for tumours) and 37 were received. Of the 30 biopsies requested for tumours, 40% were skin cancers with nine melanomas and three basal cell carcinomas.

### *General practitioner perspective*

A total of 31 GPs responded to the post-pilot survey. Eighty percent of those responding had used WT (25 individuals, 80% of active users) whereas the remaining 6 individuals had enrolled but had not yet referred cases (17% of non-active group). GPs stated advantages included shortened time to diagnosis/treatment (91.7%) compared to standard referral to dermatology, speedy response (87.5%), patient convenience (70.8%), and ability to ask additional questions or clarification (66.7%) (Figure 1). The major disadvantages were time spent uploading images (72.7%), camera cost (18.2%), patient dissatisfaction in no face-to-face with specialist (9.1%), and delay in receiving response (9.1%) (Figure 2). The 6 non-active GPs were asked why they had not used the service. Four responded: no camera available (2), no suitable occasion (1), and unable to work out what to do (1).

Most clinicians used a clinic camera (58.3%) or mobile phone (56.5%) to take pictures. A variety of methods were used for storing photographs (Figure 3). While 83.3% of surveyed GPs have a dermatoscope, 68% did not submit dermatoscope images though this number includes consultations for rashes as well as tumours. Most GPs did not use formal photographic software (72%) and did not edit their photos (72.7%). Consent was obtained verbally in 95.7% of cases with 54.5% documenting consent in the patient's file. Those who obtain signed consent uploaded it into the file though 40.9% of these clinicians did not document the obtained consent. GPs stated that obtaining consent did not add time to the clinic visit (77.3%) but taking clinical photos did (91.3%).

The majority of GPs (95.7%) required additional time outside of clinical hours to upload photos and compose the referral with a mean (and median) of 6–15 minutes to complete. Just over half of GPs (54.5%) said this was slower than a standard written referral (22.7%

said it took the same time). Most GPs were able to provide feedback to their patient without having them return to their clinic (91.3%). Upon receipt of specialist recommendations, GPs were able to update the patients by phone (68.2%), new appointment (18.2%) or other methods including SMS, email and letters.

### *Consultant perspective*

Dermatologists described the benefits of WT similar to GPs in addition to preventing unnecessary face-to-face consults. They stated that referrals were mostly appropriate but face-to-face appointments were sometimes necessary.

Disadvantages included time required, delay in response, and lack of confidence in diagnosis/management. When there was failure to respond timely, it was most often due to lack of attention to emails or holiday schedules in which they had not set the period of unavailability. Average time taken to respond to the initial teledermatology consultation was 6–15 minutes. The dermatologists would have preferred additional compulsory fields in the referral, providing supplemental clinical information, as well as better photograph quality, though most referrals were deemed comparable to standard written referrals (usually without images).

### *General feedback*

Other comments provided by the GPs included the excellent service providing educational benefit to the patient as well as the referring clinician. Suggestions for future development included standardising quality of photographs as well as supporting clinical information, creating a method for maintaining a clinical record allowing for continuity of care as well as follow-up, in addition to a financial compensation scheme. Patients provided overwhelmingly very positive feedback to the GPs regarding their teledermatology service. The number of subsequent face-to-face consultations for these episodes of care was not recorded.

### *CT progress report results*

As part of CT, all referrers are requested to complete a progress report three weeks after the initial response. Analysis of these progress reports indicate that all cases were sent to an appropriate expert with a sufficiently timely reply from the specialist (99%) that was well adapted to the local environment (100%). Almost all referring clinicians were able to follow the advice provided by the specialist (92%). If it was not possible to follow recommendations, it was due to the patient not returning to clinic (two cases) or the patient desiring different work-up (two cases). Additionally no follow-up was needed in two cases and subsequent follow-up was pending in three cases. Only one response of inability to follow advice was due to system error; the referring clinician did not receive a message about the specialist's response.

Specialist advice was considered overwhelmingly helpful (96%), both in clarifying diagnosis (82%) as well as assisting with management (88%). In only three cases was the

referral viewed as aiding in neither diagnosis nor management, though in all three cases the advice was still deemed helpful.

A total of 76% of GPs thought the eventual outcome for the patient would be beneficial with only 34% of those who responded thinking the consultation would improve the patients' symptoms and 22% would improve patient function. Ninety-one percent of referrers viewed an education benefit in the consultants' replies.

Fifty-eight percent of respondents described a cost savings to the patient and family, mostly through avoided specialist visits including time spent waiting for additional appointments as well as the cost to the patient for the specialist referral. With more accurate diagnosis, unnecessary surgeries or procedures were prevented and there was no delay in treatment. Patients were reassured that they had received specialist advice.

Fifty-one percent of referring clinicians thought that WT led to cost savings for the hospital and clinic by preventing unnecessary referrals, decreasing the burden on the public system, and allowing for triage of patients who needed hospital referrals.

When asked for additional comments related to the cases and WT service in general, GPs were overwhelmingly positive. They praised the excellent service and emphasized the potential for WT. Patients were appreciative and the WT consult even helped direct further conversation between the GP and the patient.

## **Discussion**

Previous studies of process measures have successfully demonstrated the diagnostic and management reliability and validity of teledermatology when compared to face-to-face encounters.<sup>5</sup> In addition to clinical support, teledermatology has also been demonstrated to be a cost effective approach due to travel avoidance and prevention of lost work time.<sup>5</sup> Outcome analysis is the most limited area of research. A randomized control trial demonstrated that there was no statistically significant difference in clinical course at four months in patients evaluated in clinic versus by teledermatology.<sup>6</sup>

Satisfaction and acceptability are another integral component to the successful implementation of a teledermatology system. Subjective satisfaction is quite high in previous studies as was reinforced by this project. This satisfaction is limited when workload is increased<sup>7</sup> and upon scale-up, it is important to identify methods to decrease the burden that consultations can create.

Multiple benefits of teledermatology include improved access to specialty care, triage for face-to-face appointments, ease of obtaining second opinions, education to referring clinicians, and improved communication between clinicians and patients. Perceived educational benefit has been frequently described,<sup>5</sup> with a study in the United Kingdom demonstrating that GPs compare a live teledermatology consultation to the equivalent of 6.3 days of training.<sup>8</sup>

A recent publication describing the Medecins Sans Frontieres network, also using the CT platform, noted recommendations for enhanced sustainability including increased information on systems use, improved referrals through inclusion of standardised forms and picture guidelines, as well as increased case follow-up in order to improve expert motivation.<sup>8-9</sup> These factors should be taken into consideration upon scale-up of the pilot project.

Overall, the WT pilot project demonstrated a feasible and widely acceptable approach to improving patient access to dermatologic services. Through progress reports and user surveys, participants expressed the belief that WT led to cost savings by decreasing unnecessary cost and increasing appropriate use of services thus decreasing the burden on an already overwhelmed public system. WT does not replace face-to-face specialist visits, but instead allows for appropriate triage leading to increased efficiency and better utilization of health care resources.

### *Future direction*

For sustainability, it will be important to integrate teledermatology referrals with the usual electronic options and automatically include a record of the consultation in the electronic medical record. This should decrease the time burden to all clinicians involved. The potential for funding needs to be explored, so that clinicians are reimbursed for the extra time spent for referrals and their participation in teledermatology. Expansion to other district health boards and other specialties is possible.

A rapid tele-advice system is a simple, mobile, and efficient method for providing quality care and the potential value of teledermatology in providing specialty services to the people of Waikato and beyond should be further explored.

### *Limitations*

This project is limited by participation of clinicians already familiar with and interested in teledermatology.<sup>10,11</sup> There is no available comparative standard consultation data. Stated advantages of teledermatology are based on subjective reporting by clinicians.

### **Acknowledgements**

Professor Richard Wootton and Steering Group, Collegium Telemedicus  
Robyn Carr RGON, Waikato Teledermatology co-ordinator  
Dr Sarah Hill, Dr Anthony Yung, Waikato Dermatologists  
Referring General Practitioners

### **Declaration of Conflicting Interests**

The Authors declare that there is no conflict of interest relevant to this paper. No sponsorship was received to conduct the study or for Waikato Teledermatology.

### **Funding Acknowledgement**



This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

## References

1. Krasner M, Ramsay DL. National dermatology manpower requirements - experience of prepaid group practices. *Arch Dermatol* 1977; 113: 903-5.
2. Feldman SR, Coates ML, Fleischer AB Jr, et al. Comparing the diagnostic accuracy of dermatologists and nondermatologists. *Arch Dermatol* 2001; 137: 1645-6.
3. Lowell BA, Froelich CW, Federman DG, et al. Dermatology in primary care: prevalence and patient disposition. *J Am Acad Dermatol* 2001; 45: 250-4.
4. Wootton R, Wu WI, Bonnardot L. Nucleating the development of telemedicine to support healthcare workers in resource-limited setting: a new approach. *J Telemed Telecare* 2013; 19: 411-7.
5. Whited JD. Summary of the Status of Teledermatology Research. Report for American Telemedicine Association - Teledermatology Special Interest Group. 2010: ATA.
6. Pak H, Triplett CA, Lindquist JH, et al. Store-and-forward teledermatology results in similar clinical outcomes to conventional clinic-based care. *J Telemed Telecare* 2007; 13: 26-30.
7. Collins K, Bowns I, Walters S. General practitioners' perceptions of asynchronous telemedicine in a randomized controlled trial of teledermatology. *J Telemed Telecare* 2004; 10: 94-8.
8. Wootton R, Bloomer SE, Corbett R, et al. Multicentre randomised control trial comparing real time teledermatology with conventional outpatient dermatological care: societal cost-benefit analysis. *BMJ* 2000; 320(7244): 1252-6.
9. Delaigue S, Morand JJ, Olson D, Wootton R, Bonnardot L. Teledermatology in low-resource settings: the MSF experience with a multilingual tele-expertise platform. *Frontiers in Public Health* 2014; 2: 233.
10. Oakley AM, Rennie MH. Retrospective review of teledermatology in the Waikato, 1997-2002. *Australas J Dermatol*. 2004 Feb;45(1):23-8
11. Tan E, Yung A, Jameson M, Oakley A, Rademaker M. Successful triage of patients referred to a skin lesion clinic using teledermoscopy (IMAGE IT trial). *Br J Dermatol*. 2010 Apr;162(4):803-11.

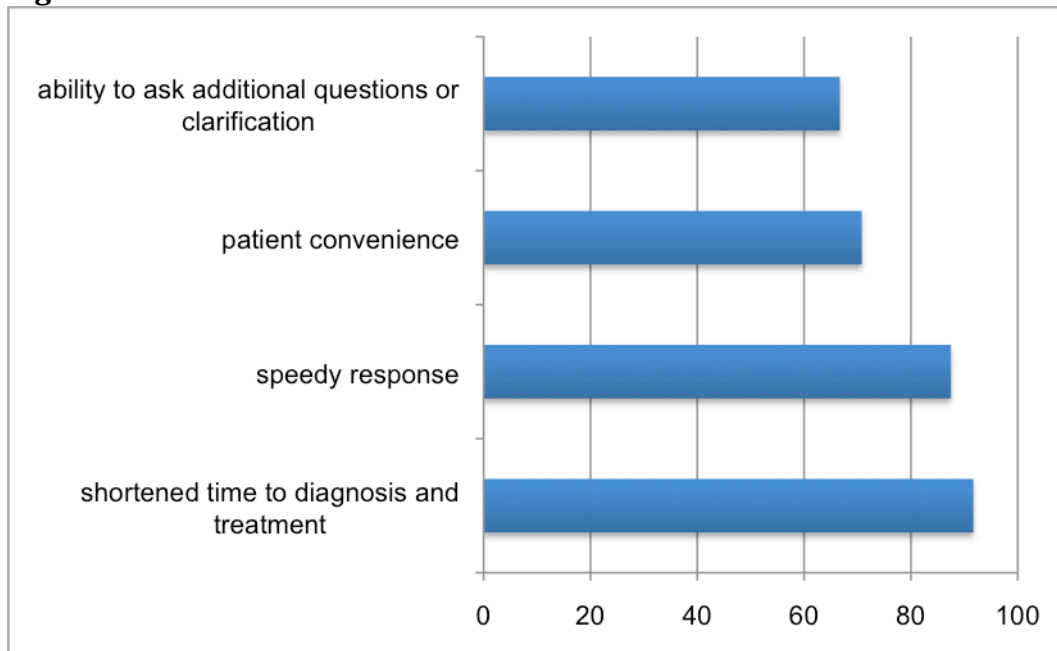
## Tables

**Table 1.** Basic Metrics of Waikato Teledermatology pilot

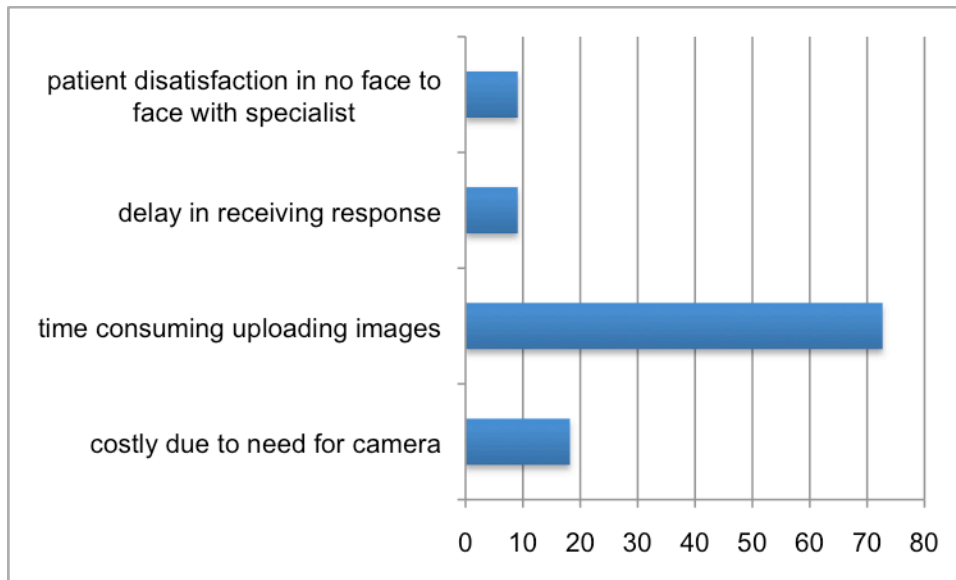
Number GPs submitting cases	31
Number cases	266
Number messages	1322
Number images	933
Number emails	2507
Median number messages per case	5
Patient age range	6 weeks - 92 years
Female: Male (%)	57:43

GP: General Practitioner

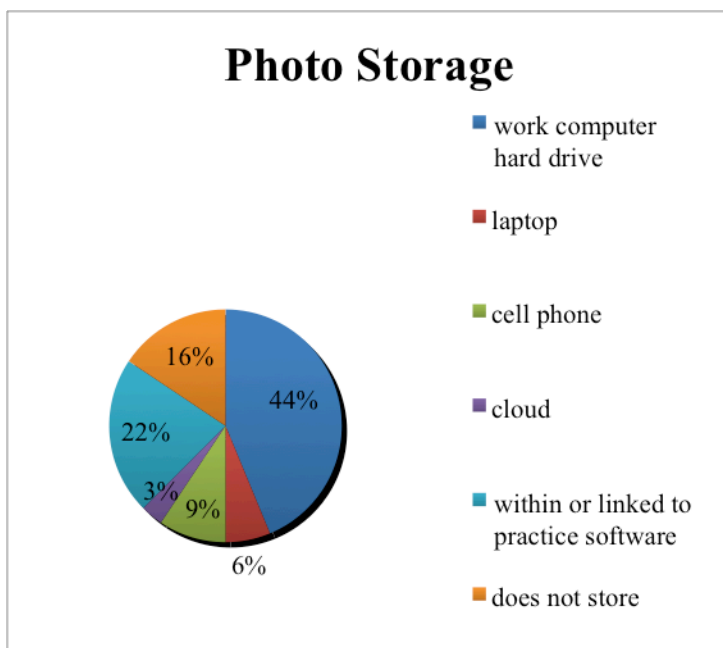
**Figures**



**Figure 1.** Advantages of Waikato Teledermatology from General Practitioner perspective (%)



**Figure 2.** Disadvantages of Waikato Teledermatology from General Practitioner perspective (%)



**Figure 3.** Methods for Storing Photographs

