The application of telepharmacy as an enabling technology to facilitate the provision of quality pharmaceutical services to rural and remote areas of Australia

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I declare that this thesis is my own work and has not been submitted in any form for another degree or diploma at any university or other institution of tertiary education.

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ABSTRACT

The provision of quality pharmacy services to rural and remote communities is influenced by the National Strategy for the Quality Use of Medicines. The implementation of National Medicines Policy is challenged by the shortage of pharmacists in rural areas. Australia compares unfavourably with both the United Kingdom and the USA in this regard. The study by the Department of Employment and Workplace Relations in 2002 identified that there is a severe shortage of hospital pharmacists in New South Wales and acute shortages of community pharmacists in Queensland regional areas.

Although the lack of a telecommunications infrastructure has been a major impediment to the extension of telehealth into rural Australia, the challenge of delivering pharmaceutical services into rural areas may be augmented by the provision of telepharmacy applications such as remote dispensing of medications, counselling and implementing medication reviews by video conferencing.

The aims of this thesis were to ascertain the opinions of relevant healthcare professionals to the concepts of telepharmacy; to identify the requirements of a telepharmacy system suitable for use in rural Australia; to develop a pilot telepharmacy system and to demonstrate the system by dispensing a limited range of products locally and then remotely via telecommunications. Thereafter, to identify an area of telepharmacy where there is a clinical need and to demonstrate the applicability of telepharmacy by means of a trial involving volunteer patients.

This study initially involved interviewing healthcare workers in northern Queensland, the Tiwi Islands, and the western coast of Tasmania to assess the receptiveness, requirements and potential for telepharmacy applications in rural and remote regions in Australia.

Thereafter a comprehensive literature search on telepharmacy applications was conducted with a view to identifying suitable equipment for use in rural Australia. Whilst the search revealed a number of examples of commercial telepharmacy applications in the USA and Europe, none met all of the defined criteria for an ideal rural Australian telepharmacy system.

Accordingly, two pilot telepharmacy systems were developed and constructed, based upon the identified criteria. For remote controlled operations under video supervision, the criteria for a telepharmacy application were defined as:

- a system capable of storing a range of individual medications to suit the intended application;
- a standard commercial dispensary computer program;

- an automated method of removing individual packs from the storage unit;
- an image acquisition device to capture and store a picture of the dispensed pack, and
- a bar code reader to record the bar code of the dispensed product.

In addition, video conferencing capability was required to enable the remote pharmacist to provide counselling and medication review services to the patient.

Four trials were conducted using the constructed pilot telepharmacy equipment to demonstrate the validity, accuracy and reliability of the systems in dispensing a limited range of products locally and then remotely via telecommunications. These studies adequately demonstrated the operation of the telepharmacy dispensing systems and identified the requirement for a different design of bar code reader in any further trials. These studies also identified that the inclusion of video conferencing in a single remote telepharmacy application was not the optimum solution and that a separate video conferencing unit was required. A simple system of quality assurance, incorporating a dispensed pack image acquisition and bar code verification was also demonstrated, resulting in the addition of a significant patient safety factor to mitigate dispensing errors.

In order to ascertain the level of support for the concept of telepharmacy and its potential applications, four key healthcare professional groups in rural northern Australia were surveyed. Pharmacists and medical practitioners were surveyed by post and the nurse group was surveyed at the 2006 Royal College of Nursing annual conference in Cairns. The nurse/healthcare group was an online Internet survey, advertised in the Nursing Careers and Allied Health booklet published in June 2006. The major findings were that 87 per cent of all the healthcare respondents supported the use of telepharmacy to provide professional pharmaceutical services to rural and remote areas of Australia. The study did, however, identify that 70 per cent of the pharmacist group surveyed were not supportive, or neutral to, the use of remotely operated automated dispensing equipment as a telepharmacy application in rural areas, when the local pharmacy was closed. The pharmacist group were also not supportive of the use of such equipment in remote areas where there was no community pharmacy (58 per cent disagreed or were neutral). These results were further analysed and revealed that the younger pharmacist age group (less than 10 years experience), were in favour of the use of the automated dispensing equipment as a telepharmacy application, where there was no community pharmacy, compared to the older pharmacist group ($P < 0.05$).

Medication reviews are a key objective of the Fourth Community Pharmacy Agreement and are provided as a fee for service basis for face to face reviews conducted in the home. They were

identified in the surveys as a clinical need which may be solved by a telepharmacy application due to the difficulty and expensive of providing medication reviews to patients in rural and remote areas.

A pilot study involving volunteer patients was conducted to demonstrate the use of a telepharmacy application in conducting medication reviews. The study recruited nine patients and the medication reviews were conducted by an accredited pharmacist via a local area wireless network, equivalent to a Broadband Internet connection. The telepharmacy interviews were recorded and provided valuable information for the pharmacist preparing the medication management reports. The patients were asked to complete a customer satisfaction questionnaire on conclusion of the video conference. Six of the patients rated the overall telepharmacy experience as excellent and three rated the experience as very good.

Whilst not removing, or negating, the need for personal professional pharmacy services, there are many potential benefits for telepharmacy applications directed at rural communities. However, it is important that it includes and retains the active role of the pharmacist in the delivery of pharmacy services to achieve the highest quality of care for rural communities and for the safety, and welfare of the public related to the use of pharmaceuticals. Pharmacist involvement is essential for patient counselling and medication reviews, with their exclusion increasing risks to the patient and leading to a higher incidence of medication errors, adverse events, and excessive drug costs. The study has thus provided evidence that telepharmacy applications may potentially lead to unique and innovative ways to deliver quality pharmacy services to rural and remote areas.

CONTRIBUTION OF OTHERS

I acknowledge the contribution of others in the preparation of this work:

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List of Publications

The following publication by the candidate has emanated from the work presented in this thesis. The paper is published in a refereed journal.

Kimber MB, Peterson GM. Telepharmacy - Enabling Technology to Provide Quality Pharmacy Services in Rural and Remote Communities.
Journal of Pharmacy Practice and Research. June 2006; Volume 36(2):pages 128-33.

List of Conference Presentations

The following presentations have been delivered at international pharmacy conferences during the candidature period.

Kimber MB, Rasiah R, Nimmo A, Manning RW. Can Remotely Situated Dispensing and Counselling Units, Controlled by a Pharmacist situated in a Call Centre, provide Quality Pharmaceutical Services to Rural Communities in Outback Australia? World Congress of Pharmacy and Pharmaceutical Sciences
4-9 September 2003; Sydney: FIP; 2003. (Poster Presentation).

Kimber MB. A program for remote communities to resolve access to pharmacists; supply of medicines, and recording of video link pharmacist-patient counselling and secure access to recorded video conferences. World Congress of Pharmacy and Pharmaceutical Sciences 2004; 2004 4-9 September; New Orleans: FIP; 2004. (Poster Presentation).

Kimber MB. Pharmacopoeial standards for medicines in the proposed joint Australia /New Zealand therapeutic products agency. Quality-International 2005 Conference; 21-22 November 2005; London: FIP and RPSGB. (Poster Presentation).

Copies of the above appear in Appendix D

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