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# TARDIS EVALUATION

REPORT ON FINAL USAGE EVALUATION OF THE TARDIS  
TELEHEALTH SYSTEM

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**Author:** Geraldine Fitzpatrick

## For more information

DSTC Pty. Ltd.  
Level 7  
Gehrmann Laboratories  
Research road  
The University of Queensland  
Qld 4072 Australia

Telephone (07) 3365 4310  
Fax (07) 3365 4311  
Email [enquiries@dstc.edu.au](mailto:enquiries@dstc.edu.au)  
Web [www.dstc.edu.au](http://www.dstc.edu.au)

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# TARDIS Evaluation

## EXECUTIVE SUMMARY

This report presents a final evaluation of the usage of the TARDIS telehealth system in the three ICU project sites - Royal Brisbane Hospital (RBH), Nambour General Hospital (NGH) and Maryborough Base Hospital (MBH). The focus of the report is on the use of the system for clinical consultations about patients, however, the report necessarily touches upon many other uses of the system since they are integrally intertwined. The lessons learnt are applicable across the full gamut of clinical services, not just ICU.

Data for the evaluation were gathered via semi-structured interviews with a wide selection of users (medical, nursing and allied health) of the system from the three sites, and from 52 post-consultation evaluation forms.

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### FINDINGS

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The TARDIS project has demonstrated that there is great potential for telehealth solutions incorporating both video-conferencing and data-sharing capabilities to improve healthcare delivery through improved patient management and expansion of peer networks.

### USES

**CONSULTATIONS:** The system has been used for over 60 consultations to June 1998. The pattern and frequency of consultations have been different to what was initially envisaged. Consultations predominantly involved neurological conditions, between NGH (ICU or DEM) and RBH 4B.

Consultation benefits for *patients* have included:

- Shorter consultation cycles, more appropriate transfer decisions (saving inappropriate transfer costs), earlier instigation of appropriate management, advanced preparation at the transfer site, e.g., for surgery. Patients' families have also benefited, e.g., through a patient remaining in the local unit close to home.

Consultation benefits for *clinicians* have included:

- More interactive discussions about the patient, increased confidence about the exact nature of the patient's condition, increased trust, increased learning opportunities for the junior clinician, increased confidence in ongoing management decisions, and expansion of peer networks.

An expansion of the telehealth network both within sites and between sites is needed before the full potential of telehealth can be properly explored for the full range of patient data and conditions.

**CLINICAL EDUCATION:** The most significant use of the system has been for clinical education. The main use has been medical, e.g., for inservice sessions, grand rounds, case studies etc. Allied health, namely physiotherapy, also regularly use the system for inservice. Nursing inservice sessions occur less frequently, mainly due to the difficulty in freeing staff from the bedside to attend.

Despite widespread frustration with the technological problems, e.g., poor audio, people were universally positive about the education sessions and found them to be highly beneficial. This was especially so at the non-tertiary sites. They generally appreciated being able to access resources and expertise that they would not otherwise be able to, and being able to share the educational load. There have also been significant benefits in fostering peer networks and collegiality.

While many of the technological problems were eventually improved or resolved, there was still some concern about the adequacy of a desktop system in delivering medium-large group, multi-site educational sessions.

OTHER USES: The system has been used for a large number of other purposes, scheduled and ad hoc, by a number of clinician groups. Examples include meetings of Critical Care Nurse educators, practice sessions for medical exam vivas, meetings for pathology, infection control, etc.

### **IMPORTANCE OF THE PROJECT OFFICER ROLE**

One of the main achievements of the TARDIS Project Officer (POs) has been their facilitation of a range of clinical uses of the system. This has involved experimentation with technologies and techniques to find the most clinically acceptable configurations to optimise patient outcomes. They have also played a pivotal role in evolving with clinicians the new work practices to take advantage of the technology.

The importance of the PO (as in the TARDIS project) or a Support Officer (SO) role in general cannot be understated. The prime importance is for ongoing identification and facilitation of clinical usage of the system. As such, a good clinical background is essential. The SO is also important for ongoing lobbying for appropriate resourcing for the system, and for practical trouble-shooting and maintenance of the system.

### **BENEFITS**

GENERAL BENEFITS: *Cost savings* from inappropriate transfers provide the most tangible measurable outcomes. More important longer-term outcomes for Queensland Health however, are the less tangible ones arising from interaction over the system. There is already clear evidence for the *expansion of peer networks* across sites; for example, many clinicians report feeling far more comfortable and more likely to phone a 'telemedicine' colleague for advice. There is also the development of local experience/expertise, either as a result of caring for patients who might otherwise be transferred or via education sessions.

FLOW-ON INFLUENCE FROM TARDIS: The influence of the TARDIS project has been widespread across the state. As examples: there are many sites beyond the three project sites now participating regularly in TARDIS education sessions. The Queensland Critical Care Nurse Educator group has instituted small network meetings across the state based on the model started by the educator group within the TARDIS project. PO expertise is being drawn upon within their hospitals for other video-conferencing uses.

### **BARRIERS**

There are both technological and organisational/people barriers to more effective and widespread use of the system.

TECHNOLOGICAL: Unstable and unreliable technology – an issue of significant concern, although the situation has improved over the course of the project; Complex, difficult-to-use technology; Inadequate cross-site facilities matching predominant referral patterns; Incompatible technologies.

ORGANISATIONAL/PEOPLE: Inadequate organisational or managerial support, e.g., inadequate resource allocation, unsupportive culture; Lack of clinician time to experiment with the potential of the technology, and to evolve new clinical practices; Lack of awareness about the clinical potential for the system; Insufficient visibility or availability of PO, especially at MBH; Lack of staff training and familiarity with the system, and infrequent use of the system to gain or reinforce system knowledge.

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### SUMMARY OF PROJECT STATUS

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- The TARDIS project has demonstrated that telehealth systems offering both video-conferencing and data-sharing facilities have the potential to generate significant benefits for patient outcomes and clinician support networks.
- However, the appropriation of telehealth by clinicians is at a critical stage.
- Significant effort has been expended to date in laying the groundwork for the use of telehealth (experimentation with technologies and evolved work practices). The sites are now starting to see a dramatic increase in interest/use from clinicians.
- The next 12 months will be a critical period for moving beyond the experimentation stage to the point where telehealth is integrated into normal clinical practice.

*This is consistent with reports from other telehealth projects (Mitchell, Missouri).*

*There is evidence that the paradigm shift to integrate telehealth into everyday practice is starting to happen with more widespread experimentation and adoption of the system for clinical and clinician support.*

- A dedicated site SO (similar to PO) with a clinical focus is essential for ongoing facilitation of this paradigm shift and integration process at the grass-roots level.

*The SO (or SOs) can also provide a primary point of contact for coordination of all telehealth activities at a site.*

- MBH is at a particularly critical stage.

*It is widely acknowledged that the system is grossly under-utilised. There is still a significant amount of enthusiasm for the potential of the system but none of the clinicians have the time nor expertise to realise the potential. The potential for telehealth support between MBH and the newly opened Hervey Bay Hospital was especially mentioned. All interviewees believe that a full-time telehealth SO is needed to realise this potential.*

- Ongoing change requires top-down organisational support to resource not only the technology but, more importantly, the human and cultural aspects of change.
- Ongoing change also requires the time and commitment of clinicians to explore with the SOs how technology can be used to support patient care.

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## RECOMMENDATIONS

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The results of this evaluation reinforce the fact that telehealth is not about technology per se, but technology put to work for some benefit. As such it is about clinicians, patients and organisations. It is about making paradigm shifts in healthcare delivery and evolving new ways of working and networking.

**KEY RECOMMENDATION:** Hence the key recommendation of the report is that ongoing resources be made available for telehealth at each site, most critically in the form of dedicated Support Officers with a clinical focus, to build on the foundation laid by TARDIS and to facilitate ongoing adoption, co-adaptation, and integration of telehealth into everyday clinical practice.

**SUPPORTING RECOMMENDATIONS:** Supporting recommendations to broaden use and ownership of the system are:

- That work continues to actively promote and explore more clinical uses of the technology with clinicians.
- That work continues to explore technological options that are stable, reliable, easy-to-use, and, ideally, integrated with existing hospital IT infrastructure and the broader telehealth network.
- That more access points to the telehealth network be made available within sites.
- That the telehealth network between sites be expanded to reflect key referral patterns.

*Telehealth is not about technology per se, but technology put to work for some benefit. As such it is about clinicians, patients and organisations. It is about making paradigm shifts in healthcare delivery and evolving new ways of working and networking.*

*“It’s pioneering stuff, learning how to use [the telemedicine system] well.”*

*Allied Health Professional, MBH.*



# 1. Introduction & General Comments

This report presents the findings from an evaluation study of the usage of the TARDIS telehealth<sup>1</sup> system across the three Intensive Care Units (ICU) project sites – Royal Brisbane Hospital (RBH), Nambour General Hospital (NGH) and Maryborough Base Hospital (MBH). The study is undertaken as part of the final report on the TARDIS project to Queensland Health.

The *main conclusion* of the report is that the TARDIS project has laid some very important foundations, not just in the technological infrastructure, but more importantly in the clinical and organisational aspects of the integration of telehealth into the everyday work practices. Already there have been significant benefits for patient outcomes and for expanded peer networks. The lessons learnt are applicable across the full gamut of clinical services.

The *key recommendation* from the report is that appropriate resources, most critically dedicated Support Officers<sup>2</sup> (SO) with a clinical focus, be made available to facilitate the ongoing paradigm shift in healthcare delivery.

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## METHOD

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Data for the report was gathered primarily via semi-structured interviews. Those interviewed included 11 medical personnel (of whom 4 are consultants), 10 nursing personnel (of whom 3 are TARDIS project officers, called ‘POs’ in this report), and 1 allied health professional. These personnel represented a range of experiences and uses of the system. The representation from each site was 8 from RBH, 7 from NGH, and 7 from MBH. Detailed notes were taken during interviews, and, where possible, the interviews were recorded. However, due to technical difficulties, much of the recorded data is not useable. Quotes from interviewees have been re-constructed as faithfully as possible. Real names are not used to preserve anonymity, although total anonymity might not always be achievable. Written material from the POs has also been drawn upon where appropriate.

Data was also collated from 52 evaluation forms covering a subset of consultation events (30 out of 64, from the period of June 1997 to February 1998). Participants were asked to complete an evaluation form after each patient consultation event.

This data set is acknowledged as incomplete but represents the pragmatics of dealing with busy clinicians<sup>3</sup>. Clinicians were not always available to be interviewed, despite having prior appointments made to do so. Not all participants in all consultation events had completed evaluation forms.

The methodology in working through the evaluation is predominantly qualitative, except as noted throughout the report. Due to problems with completeness and consistency, limited use could be made of data from the evaluation forms.

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<sup>1</sup> The terms ‘telehealth’ and ‘telemedicine’ are used interchangeably throughout this report.

<sup>2</sup> We will talk about Support Officers (SOs) in a generic sense. In the TARDIS project, the support officers were called Project Officers (POs).

<sup>3</sup> In this report, we use the term ‘clinician’ in the broadest sense to encompass nurses, doctors, and allied health, i.e., any person engaged in direct clinical care of patients.

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## REPORT STRUCTURE

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This report is structured as follows:

- In the remainder of this section, we introduce the area of ICU telehealth and summarise some general perceptions of the TARDIS project.
- In Section 2, we examine different types of uses of the system, concentrating especially on consultations but also looking at education, other scheduled and ad hoc uses, and related general usage issues. We also consider the more general outcomes of system use including the pioneering of new work practices and the flow-on influences from the project.
- In Section 3, we draw specific attention to the critical role of the Project Officer in facilitating the installation of telehealth systems, and, more importantly, the integration of telehealth into clinical practice.
- In Section 4, we consider the project from the perspective of the different sites and professional groups involved in the project.
- We conclude in Section 5 with a summary of the benefits and barriers of telehealth, the user suggestions for future use of telehealth, and the general conclusions from the report.

The style of the report is to present key points in normal text for quick reading, with supporting comments and reconstructed quotes from interviewees (in double quotes) in italicised text for more detailed reading. Some points will be repeated under different categories.

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## FEATURES OF ICU TELEHEALTH

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The integration of a technology to support telehealth in any domain requires significant paradigm shifts. Such paradigm shifts require the investment of time, effort, and commitment to explore the possibilities of the technology and to evolve the work practices to exploit the technology for the benefits of patient care.

The ICU domain adds its own challenges. One of the primary goals of the TARDIS project was “to support ICU clinical and educational activities”. ICU has particular features that differentiate it from many other uses of telehealth solutions, e.g., tele-psychiatry, and that make the achievement of such goals even more challenging.

- *ICU work is unpredictable, time critical, and event driven. Hence, it is difficult to predict or pre-book consultation uses and difficult to ensure that staff will be available for scheduled training and education sessions.*
- *ICU patients are often unconscious or sedated and so not able to actively participate in their own care. Hence, patients rely on the clinicians’ ability to accurately represent their condition to others with whom they consult on their behalf.*
- *ICU staff tend to be busy and work with high levels of stress. Only one of the three units in the project is staffed according to recommended levels. Hence, staff members in these units are even busier and more stressed.*

*Free time for ICU staff is a rarity and a luxury for which there are many competing demands. Learning how to integrate a telehealth solution into work practice is low on the list of demands.*

- *ICU is a high cost area, tertiary ICU even more so. Patient transfer costs are also high. Hence, there is the potential for significant cost implications of sub-optimal patient management, and inappropriate transfer of patients into a tertiary centre, and significant cost savings if management and transfer can be optimised.*

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## GENERAL PERCEPTIONS OF THE TARDIS PROJECT

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Before discussing specific uses of the TARDIS telehealth system, we first outline some of the general perceptions held by clinicians about the project that arose during interviews:

- There is a considerable degree of *pride* in what has been achieved to date in the project.

*The project has pioneered some innovative uses of telehealth, having subtle yet far-reaching effects.*

*POs and other who have used the system have gained considerable skills and knowledge about acceptable technical standards needed to support clinical practice, and the various ways in which clinical practice can take advantage of telehealth.*

- There is a general *frustration* with the reliability and stability of the technology, but also general agreement that the situation has been *improving*.
- There is increased awareness of the *difficulty in predicting actual uses* of the system and the difficulty in fully understanding the potential of the technology as a tool for work without significant effort, both clinically/culturally and politically.
- There is a significant degree of *enthusiasm for the potential* of the system to support a rich and varied array of health work.

*Many people had to actually use the system first before they started to see its potential and get excited about it.*

- This enthusiasm is coupled with a *frustration* about the lack of clinician time, energy and focus to realise the potential.

*Many people had innovative and practical ideas for how they wanted to use the system, but recognised that they were not in a position to 'make it happen'.*

- There is a universal *belief* based on experience to date that the Project Officer (PO) role is *critical* to success.
- There is a considerable degree of *sensitivity* and awareness of the potential of the system to promote the tertiary centre as the only source of expertise, and the rural centres as the “poor country cousins”. Significant effort has been expended to promote participation and input from all centres and to focus on sharing expertise wherever it might be found.

- There is some degree of *disillusionment* with the slow progress of the project and the functionality and complexity of the technical solution compared with the perceived promises at the beginning of the project – rhetoric versus reality.

*“The project hasn’t been as successful as it could have been.”*

*“The system isn’t as simple to use as it should be.”*

*Factors that have contributed to this perception include the slow changes in clinical work practices, ongoing problems with technology, the promise of a new software environment that failed to deliver, and inadequate PO support especially at one site.*

- There is some concern that the project is *not being adequately advertised*, e.g., in selling the potential of the system, and in promoting the achievements of the project date.
- There is universal agreement that the *telehealth* functionality developed by the project *should continue* to be made available and evolved, but with the universally agreed proviso that *adequate human resources* are provided to support it.

## 2. System Uses

The TARDIS system has been used for a variety of purposes. We discuss each in turn:

- Consultations and nursing handovers;
- Education: medical, nursing and allied health;
- Other system uses: scheduled sessions and ad hoc uses.
- Related usage issues: staff training and system location.

We also discuss more general outcomes of the use of the TARDIS system:

- The pioneering of new work practices and
- Flow-on influences from the TARDIS project.

We conclude with a summary of the key lessons learnt from system uses:

- The advantages of telehealth;
- Requirements for the integration of telehealth into everyday practice.

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### CONSULTATIONS

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The support of clinical ICU consultations between units was one of the primary motivators for this project.

Up to 23 June 1998, 63 consultations had taken place using the telehealth system. The majority of these consultations were neurological consultations between NGH (originating from Department of Emergency Medicine (DEM) or ICU) and RBH (4B Neurological Intensive Care Unit). To illustrate the range of uses, of the 30 events captured in the evaluation data, 3 were solely for nursing handover (5 others also involved some form of handover), 1 for a burns case, 1 for a respiratory problem, 1 for an eye case, and 1 for a radiological consultation. The remaining 23 events were for neurological consultations.

REASONS: Consultations occurred for a variety of reasons.

- *The most common reasons chosen from the evaluation form, and collated for events, were: to consult on patient treatment (19; 63.3%); to consult on test results (15; 50%); to get a second opinion (10; 33%); to discuss advisability of a transfer (10; 33%); to support patient handover (8; 26.7%); and other - to confirm a decision made by phone (1; 3.3%). (More than one response was permitted.)*
- *On interview, clinicians also distinguished between requesting transfer in cases where transfer to a tertiary centre was clearly indicated (because of lack of expertise or space or facilities/resources) and requesting advice as to whether transfer was required in less clear-cut cases.*

- *Some clinicians also made the point that they already knew “what should be done” but liked the confirmation they received from a consultation.*

INITIATION: In the beginning, the POs were largely responsible for initiating use of the system for consultations. Clinicians now initiate most of the consultation uses.

CONSULTATION PROCESS: There appears to be a ‘usual process’ for engaging in a telehealth consultation.

- *The local<sup>4</sup> doctor phones the consultant<sup>5</sup> doctor making an initial request for consultation. They exchange varying amounts of information about the patient’s condition and arrange to exchange information via the telehealth system. The local doctor either scans in the required information him/herself or requests the assistance of the PO or a nurse on duty in the unit where the system is located. Another phone call is made to arrange the download of information to the consultant site, usually involving the PO or nurse there.*

*If both doctors are available at the same time, the doctors then consult face-to-face (synchronously) over the system. Otherwise, the scanned information is perused by the consultant doctor when he/she is free (asynchronous use of the system), and a follow-up phone call is made to the local unit.*

- *Before RBH 4B (Neurological ICU) had their own system, the consultant doctor had to go to RBH 7G ICU to access the system. A large percentage of the neurological consultations during that time took place asynchronously, indicating that location and accessibility of equipment can be a significant factor in the way the system is used.*

Interviewees report that the ‘usual process’ is often frustrated by technical problems, both software and hardware.

*“One of the more difficult things is when problems happen. It’s the time factor – the system is needed NOW. Very infrequently was it human error ... mostly software, network or hardware problems ... something outside what the operator should be asked to deal with.”*

*The Survival Guide is almost never consulted in the case of problems. People tend instead to access any available PO or knowledgeable peer at any of the sites.*

DATA SHARING: CT scans have been the predominant form of data shared over the system (apparently in 22 of the 30 events covered by the evaluation forms). This is understandable given that the majority of consultations have been for neurological reasons.

While the evaluation form data is inconsistent within events and therefore unreliable, it appears that other data shared via the computer included X-Rays (3), ECG readings (2), images (still or video) of the patient’s appearance (3), and pathology results (1).

The *value of the data* shared depends very much on the case at hand and the quality of the data.

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<sup>4</sup> The term ‘local doctor’ is used here to refer to the clinician, usually at the regional site, requesting the advice of the consultant doctor.

<sup>5</sup> The term ‘consultant doctor’ is used to refer to the clinician whose expertise is being accessed, usually at the tertiary centre. This doctor is usually a registrar in a training programme but can also be the senior Consultant.

- *Interviewees consistently praised the high quality of the CT scan images (in one case, there was a problem of misinterpretation but the cause was the quality of the original scan rather than the scanning process). Evaluation form respondents consistently gave CT scans a rating of 5 (on a scale of 1=not useful to 5=very useful), in response to the question of “how useful did you find the information on the computer for clarifying what was being said”.*
- *The patient’s appearance was rated as 5 (very useful) by all participants in a burns consultation, although one surgeon still thought that he would like clearer images of the skin burns. By contrast, the patient’s appearance was only rated as 3 by participants in an eye consultation. The POs believe the problem was a technical one and that a better quality image could have been achieved had the participants sought their help at the time.*

OTHER DATA SHARING REQUIRED: On the evaluation forms, a cardiac echograph was the only other form of data that a clinician would have liked to have seen/shared but couldn’t.

On interview, most clinicians felt that it was easy to relay verbally other forms of information such as pathology results, physiological status data, medical history, etc. These were regarded as fairly routine data, often referring to known standards and about which clinicians had a common understanding.

On the other hand, one neurological doctor, who has used the system extensively as a consultant for viewing CT scans, stated that it would be useful at times to see the actual blood test results and to see a neurological examination of the patient that she might request or direct (either in real-time or via re-played video). She noted that sometimes she would be told that a test result was normal when in fact it was not. She also noted that some doctors were not good at reporting the actual state of the patient, hence wanting to view the patient herself.

DIFFERENTIAL EFFORT OF USE: The sending and receiving sites expend different orders of effort to use the system.

*SENDING SITE: Consultations via telephone involve minimal preparation effort from the sending site. Consultations via the TARDIS system require significantly more preparation time and effort to scan in data to be shared and/or to establish the connection.*

*Of the non-0 preparation times<sup>6</sup> noted on the evaluation forms, the average preparation time was 22 minutes. Interviewees frequently reported preparation times of approximately 30 minutes.*

*Often, the preparation is carried out by the PO or the senior nurse (CN) on duty.*

*At NGH, the CN is usually in a supernumerary capacity. Interviewees stated that the degree of imposition depended on how busy the unit was in general – “not really a problem if the unit isn’t too frantic”.*

*One CN saw that there could be a positive trade-off in that if the patient was transferred, the time for consultation set-up saved days of patient care.*

*At MBH ICU the imposition on nursing staff is much greater because they do not have supernumerary staff. Nursing help to set-up is at the expense of direct patient-care time.*

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<sup>6</sup> Preparation times of 0 minutes were mostly noted for clinicians, where it is assumed, or noted otherwise, that another person performed the set-up. Other cases of 0 preparation were noted for some nursing handovers where no data was shared.

*At NGH, there is an increasing trend for a couple of the local doctors to scan in the data themselves, especially for after-hours calls, thus reducing the reliance on CN help.*

*RECEIVING SITE: Preparation time at the receiving site was consistently reported as being much shorter than the sending site. Preparation time was mostly concerned with downloading the images, and finding the clinician who would be accepting the call. Again, the CNs were the ones who did this work and the imposition depended on the busyness of the unit at the time.*

TECHNOLOGY ISSUES: There were frequent complaints about the *time and complexity of the scanning process*. One interviewee saw automation of the scanning process as only a partial solution because there was still the problem of the scanner warm-up time between scans.

*There is evidence of work-arounds to avoid scanning (holding a CT scan up to a light and pointing the video camera at it) and choosing not to scan (to the detriment of the patient in the case where the CT scan would have indicated that the facio-maxillary surgeon should have been called earlier.)*

System reliability was also an issue:

*"[The system] crashes with monotonous regularity!"*

*"One of the more difficult things is when problems happen. It's the time factor – the system is needed NOW. Very infrequently was it human error ... mostly software, network or hardware problems ... something outside what the operator should be asked to deal with."*

*"The technical problems can be really annoying, especially if you've come in from home after hours for a consultation."*

*"Many of the delays and faulty software applications have been beyond our control but are, none the less, major detractors from our mission."*

*"Even the local champions are getting frustrated with the technology problems."*

The audio quality has also been a significant ongoing problem, although the POs, and interviewees in general, feel this is being resolved.

*"There have been frustrating technical hitches with the audio where we've even had to stop the sessions."*

The audio delay is not seen as a problem. Staff have generally been very tolerant of the audio delay and adapted their interactions accordingly by stopping at regular intervals, and giving opportunity for feedback/questions.

On evaluation form feedback, 85% of respondents stated that the technology did not "interfere with the easy exchange of information" (by choosing 1 or 2 on scale of 1=not at all to 5=significantly).

## CONSULTATION OUTCOMES

Telehealth consultations have different benefits for different groups. We present examples of different outcomes for the patient, clinicians, and patient family.

PATIENTS:

*“As a project, we have begun to see some real, substantial, and life-altering outcomes as a direct result of the use of the Telemedicine system.”*

- Avoidance of unnecessary transfer.

*Doctors at NGH were uncertain enough about a lesion on a CT scan that they thought the patient should be transferred to RBH. When the neurological registrar at RBH saw the scan, he/she was able to determine that it was an old lesion and that an outpatient appointment should be made instead.*

- Avoidance of risky transfer.

*MBH had requested a retrieval to RBH of a patient with a worsening upper airway obstruction. In response to the request, the doctors consulted over the TARDIS system. More importantly, the consultant doctor at RBH was able to directly interact with the patient at MBH to determine the severity of the patient's airway problem and to see how he was able to move around. The consultant then suggested that MBH perform a tracheostomy and transfer the patient by road the following day if stable, thus avoiding a risky helicopter transfer in the middle of the night.*

- Shorter consultation cycles, hence earlier receipt of appropriate care.

*A consultation cycle that would have taken 1½ days was reduced to 4 hours. A doctor at NGH overheard a colleague organising to have hard copies of CT scans made and taken by courier to RBH to seek advice about transfer. He suggested that the TARDIS system be used instead. “Before the hard copy of the CT scans would have even been ready for the courier”, the local doctor had the CT scans put into the system, consulted with the neurological consultant at RBH, engaged in a detailed discussion about the patient's condition and the complicated confounding factors, performed a repeat CT scan as per the consultant's suggestions, repeated the on-line consultation, and had the patient transfer accepted and organised.*

- Advanced preparation for reception of patient on transfer.

- *By reverse example, if a CT had been shared in an eye consultation, the consultant doctors would have realised “there was more to it [the bony injury]” and called in the facio-maxillary surgeons earlier.*

- *A decision had already been made via phone consultation to transfer a patient from NGH to RBH 4B and the neurosurgeons were going to re-evaluate the patient on his arrival. The POs heard indirectly about the transfer, and facilitated a transfer of the patient's CT scans via the system. As a result of seeing the scans, the RBH neurologist decided the patient's condition was much worse than originally thought from the phone description. Instead of re-evaluating on arrival, they prepared an operating theatre and the patient was brought to surgery directly from the helicopter.*

- Optimised clinical management of condition, hence improved morbidity.

## CLINICIANS:

- 63% of clinicians from the evaluation forms rated the consultation session as very valuable or valuable (5 or 4, on a scale of 5=very valuable to 1=not valuable) for “guiding/supporting whatever you did next”.
- Consultant doctors are able to see information first hand and do not have to rely on another’s description or interpretation.

*“Sometimes you get sold a lemon [over phone consultations].”*

*“Sometimes you get told [over the phone] that results are normal but they’re not.”*

*“You know that what your seeing is what you will be getting.”*

*“Seeing is believing.”*

*“A picture [of the patient] tells a thousand words.”*

*“It makes things easier than giving advice over the phone.”*

Some considered this especially important for neurological data:

*“Neurosurgery is quite specialised and people only tend to have peripheral knowledge about it. Consultations over the phone are not good enough often enough ... Describing CT scans is difficult, especially for people who aren’t that experienced. And the interpretation of what is significant can be difficult as well.” [Neurological Registrar]*

- The consultant doctor has greater confidence in management/transfer decisions.
- The local doctor is more confident about the ongoing management of patients at the local unit because of the consultant management support.

*One doctor commented that he also felt better going back to patients/families and justifying the management decision.*

- The local doctor has opportunities to learn when the consultant doctor has time to talk through their reading of the shared data.

*Clinicians at NGH were particularly keen to take advantage of such opportunities for learning. However, this relied on the consultant doctor verbalising what they were looking at, and more importantly, synchronising views of the shared data so the local site could see what was being talked about. Synchronisation required specific mouse clicks for each move rather than the more intuitive use of the scrollbar to scroll the image. It has taken a while (and frequent reminders) for the consultant doctors to do this.*

- Most doctors find the system to be better than traditional telephone consultations and tend to engage in more interactive discussion about the patient’s condition.

*On interview, many clinicians stated that it was easier to speak to people over the system than over the phone. Consultant doctors also stated that it was easier to ask questions of the remote site.*

*“Once you get used to the camera and forget about the interface, communicating face to face is vastly superior to the telephonic variety.”*

*A minority of local doctors stated that they found consultations via the system more intimidating and confronting. One admitted this was probably due to feeling like his inexperience would be more easily “caught out”.*

- Clinical information that is shared over the system can be saved and used by others at a later time.

*A CNC accessed the stored information about a patient being transferred into the unit to “see what they were getting” and to “make sure the unit would be adequately staffed”.*

*A neurological registrar frequently uses the saved scans to show the Neurological Physician after the session.*

- New relationships between clinicians have been fostered (in conjunction with other uses).

#### FAMILIES:

- The trauma of moving patients away from family can be avoided.

*A decision to transfer a burns patient from NGH to RBH was reversed after the surgeon saw the full extent of the burn injuries via a video played over the system. Instead, palliative care was given at NGH, avoiding a dislocation and dispersion of the family at a difficult time since not all family members would have been able to travel to Brisbane with the patient.*

- Family members can be supported in the case of transfer by introduction to staff at the tertiary centre.

*Using the TARDIS system, the wife of a patient was able to meet the nurses who would be looking after her husband prior to his transfer from NGH to RBH 4B. She found this very helpful at a difficult time and later appreciated having a familiar face open the door to her at RBH.*

#### GENERAL OUTCOMES:

- Significant savings of transfer costs.
- Re-distribution of cost/risk of patient care, e.g., to the local unit when the patient might have otherwise been transferred.

*MBH clinicians were now asked to perform a tracheostomy on a patient that had potential to involve a dangerous intubation (according to the consultant doctor).*

*NGH ICU incurred the cost of providing palliative care for the burns patient.*

- Development of experience and expertise at the local site.

#### PERCEIVED BEST USES OF TELEHEALTH PATIENT CONSULTATIONS

- Interviewees believed that there were clear cases where consultations via the system would be most beneficial.

- *For more intricate or marginal cases, i.e., patients who “may or may not go”;*
- *For patients who don’t need to be transferred;*
- *Where “visual stuff is important, where pictures are going to make a difference”;*
- *Especially where more junior or inexperienced doctors were involved;*
- *Especially for smaller country hospitals and clinics;*
- *And when the consultant “suspects the data interpretation”.*
- Some senior clinicians felt that they were able to manage consultations with other senior clinicians well enough by phone because they were experienced at painting verbal pictures, could communicate succinctly, knew the clinical domain, and tended to know each other and trust each other’s judgement.
- A small number of interviewees felt that the system offered little or no marginal value over the telephone. (None of these interviewees were involved with neurological consultations.) Others agree that this could well be so for “straight forward cases”.

### REFLECTIONS ON CONSULTATION USES

At the beginning of the project, it was anticipated that the TARDIS system would be used for more consultations, and for a much broader range of cases than it has been. While there has been a range of experiences, e.g., with eye, burns, respiratory, and radiology cases, such non-neurological cases have been the exception rather than the norm. There could be a number of reasons for this:

- The need for ICU consultations was over-anticipated.

*NGH ICU is a very well staffed unit with three specialist intensive care physicians. Neurological consultations dominate because they do not have that expertise available within the hospital. MBH have more CCU patients than ICU patients.*

*A statement by an allied health professional could perhaps also apply to medical consultations: “I’m amazed at how desperate we were to pick others’ brains ... now we don’t feel such a need. Suddenly we don’t seem to have the critical patients we had two years ago. Or maybe we’re just too busy and can’t see but if we did find out more now [through consultation] we could be pre-empting problems later on...”*

- The need for consultations using the telehealth system was over-anticipated.

*The telephone is significantly easier to use than the telehealth system, and firmly embedded into existing health care practices through well-established processes for consultation/referral. These processes are often perceived to be working well enough often enough (though not by one neurological registrar).*

- The dominant referral patterns of the participating units are not supported.

*MBH ICU is also combined with CCU. Most of their patients are cardiac patients and most of their referrals are to Prince Charles Hospital (PCH). MBH also have their own specialist physicians in various areas.*

*RBH 4B does a lot of consulting for, and receives many transfers from, Lismore and Toowoomba hospitals. Neurological clinicians saw great potential for also having these hospitals “on-line”.*

- Changing from the way things have always been done is difficult and takes time.
- Clinicians also need to perceive a clear benefit for patient care to justify making such a change.

*Some people are yet to be convinced of the tradeoff between time and effort to use the telehealth system compared to the benefit gained for patient outcomes.*

*Other clinicians have become strongly convinced of the potential of the system after experiencing positive outcomes for patient care through its use.*

*Many clinicians stated that they didn’t really understand about the system or its potential until they used it for the first time.*

*A ‘chicken and egg’ problem can arise here – clinicians needs evidence to be convinced to use the system, evidence (personal and statistical) can only be gathered by getting clinicians to use the system.*

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## NURSING HANDOVERS

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It is difficult to determine exactly how many consultation uses of the system involved nursing handovers. A conservative analysis<sup>7</sup> suggests only 6 handovers have occurred out of 63 uses, 4 in 1997, and 2 to June 1998. 2 of these handovers were performed in conjunction with a medical consultation/handover.

### PERCEIVED VALUE

Participants in nursing handovers have been uniformly positive about the value of the experience:

*“It’s satisfying to know that staff at the other end who will be looking after the patient have all the info.”*

*“I was able to give them all the warm fuzzies as well as the clinical information, you know, that the minister had been called in, about the family situation, what happened to the other people in the accident ...”*

*“I got more out of it than just a phone call ... it’s more like a normal ward handover.”*

Following one handover, the staff in the receiving unit made the spontaneous request that the CN write to the sending unit, the text of which follows. While the CN in the receiving unit was reluctant to attribute the request solely to the use of the system, it is nonetheless a very unusual occurrence.

*“On [date] we received a patient [name] who was transferred from your unit following a Telemedicine handover. The Nursing staff receiving this patient have*

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<sup>7</sup> Of evaluation forms, interviews data, and notes sent to the internal TARDIS ‘usage’ mailing list.

*asked me to write and express their appreciation of such a particularly efficient transfer. The transfer was well organized, the handover concise and comprehensive and the patient obviously well cared for.”*

#### WHY DON'T NURSING HANDOVERS HAPPEN MORE OFTEN?

Despite the positive reactions to the nursing handovers that have occurred, nursing handovers are taking place less frequently. There could be a number of reasons for this:

- Time and resources are the most quoted reason.

*The non-tertiary units have been exceptionally busy during this period. (There were a number of reasons, possibly including the fact that fewer patients were being transferred!)*

*Level 1 nurses who are directly involved in the patient's care have to be relieved by other nursing staff to enable them to participate in the call. This can be difficult in a busy unit or where there are no supernumerary staff as in MBH ICU.*

- Level 1 and level 2 nurses have also demonstrated the greatest reluctance to be “seen on video” and to use the system.

*In one handover, the receiving Level 1 nurse refused to participate in the call, letting the CN do so instead. However, there were 4-5 nurses all clustered around the machine, out of camera view, interjecting questions and participating indirectly.*

- There is no clinical imperative. A comprehensive nursing handover is regarded as “nice to do” but not essential.

*“Nurses are used to getting handovers second-hand!”*

*Many of the transfers come from NGH DEM where nursing handovers do not usually happen anyway.*

*A medical handover has already occurred so staff in the receiving unit know of the patient, either by being informed by the doctor, overhearing the consultation or directly assisting in the system use.*

*The transfer nurse gives an up-to-date handover on arrival with the patient (while up-to-date, some interviewees thought that it also lacked a more comprehensive knowledge of the patient's history and circumstances).*

*“The nursing handover could happen just as easily by phone.”*

*“They [handovers using the system] are fun to do ... it's like visiting ... but doesn't make that much difference ... there is still a verbal handover at the end of a journey ... the phone is good enough for all the verbal family/history stuff that nurses give over and above the medical handover...”*

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## EDUCATION

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Over 130 medical, nursing and allied health education sessions have taken place over the system.

- MEDICAL: A regular and varied programme of inservice sessions, grand rounds and case study presentations has been in place for medical staff since April 1997.
- NURSING: A weekly programme of inservice sessions was started in December 1996 and continued through 1997 but only a couple of sessions have taken place to date in 1998.
- ALLIED HEALTH: A regular programme of physiotherapy inservice sessions has been in place since April 1997.

In the beginning, these mainly involved the three TARDIS sites. Now multiple sites from all over the state are involved in different ways.

Evaluation of education uses of the system is based on interview data from the initial three sites.

### SHARED EDUCATION ISSUES

#### BENEFITS

- Despite many frustrations, noted below, interviewees were generally very positive about the education sessions.
  - “The benefit with education is phenomenal.”*
  - “Education is the best thing [about the project].”*
  - “We get a lot more variety now.”*
  - “If someone has done the work to prepare, it spreads the audience.”*
  - “We all complained about the picture being too small. But at least we actually had an inservice! It was good.”*
- Interviewees from NGH and MBH were the most positive. This is understandable since the tertiary centre has greater access to a large range of expertise.
  - “We’re so starved for education here [MBH]. It’s great being able to access outside people.”*
  - “It’s very effective. We have speakers that we couldn’t dream about having here [NGH].”*
- New relationships and understandings between sites have built up through the education sessions.
  - “A side benefit is an increased awareness of other units.”*

*“From the [medical] education sessions, there is certainly a sense of collegiate camaraderie developing between the various sites and I feel this can only be good for QHealth. How you quantify it is another matter entirely.”*

- Participation in the sessions has expanded beyond the three original sites to also include many other hospitals throughout the state.

*Many of these hospitals have video-conferencing but not data sharing capabilities. The material to be presented at a session is emailed (or faxed if no email is not possible) in advance to these sites.*

- Education sessions have helped foster other ad hoc interactions via the system (to be discussed later).
- There is evidence that people are getting more used to using the technology for education sessions and are evolving techniques better suited to the medium.

*Some people commented that the sessions were running more smoothly now.*

*People often commented about changing their style of presentation, stopping more frequently to give each site an explicit opportunity to ask questions or to comment, and so on.*

## PROBLEMS

- There was widespread frustration with the technology:
  - The reliability of the technology;

*Technical problems have impacted on the timing of sessions. Strict reliable timing of sessions is an important issue, especially for nurses who have a narrow window of opportunity at shift changeover to participate.*

*“Inservices were often canned because the technology broke down. It’s really frustrating especially if you spent time getting ready ... it makes you suss about the reliability [of the system] in general.”*

*“People become irritable with the technical hitches.”*

- The quality of the audio;

*There are still problems with people being heard if they are not close to the microphone, or presenters being heard if they turn around to try to use a physical white-board etc. One interviewee suggested that presenters should use a lapel microphone.*

*At the beginning of each session, the POs make a point of reminding participants to use the mute button when people are not talking from their end, and to move close to the microphone if they want to speak or else have someone closer relay their question/comment.*

- The size of the screen for slides and the very small video window;

*Many people commented that using a projection screen in conjunction with the system made it easier to see.*

*One clinician now takes a Notebook computer for the slide presentation so that the slides will be independent of the system. (Each site will have their own copy of the slides.) In this way, he can make better use of the video.*

- The size of the video image, especially for demonstrations;

*“We all complained about the picture being too small.”*

- The appropriateness of the technology for large group, multi-site education sessions.

*Many people found it annoying the way the audio channel switch preceded the video channel switch in a multi-party session. Some felt this inhibited the flow of interaction because people would think twice before interjecting with a question etc.*

*A session facilitator noted that as the number of sites increased, the sessions needed to be more deliberately chaired and control, resulting in even less spontaneity in the interactions and even less involvement of the more junior people.*

*One clinician expressed a concern that this might be a case of the technology being “the tail wagging the dog”.*

- Presenters uniformly stated that presentations over the system required more time and effort.

*Powerpoint slides took longer to prepare than handwriting slides or using the white-board during the session. Slides also had to be prepared in advance so that they could be loaded into the system to be emailed (or faxed) to recipient sites.*

*Many presenters needed additional help with skills (learning how to use Powerpoint) and with resources (access to a PC to prepare the slides). This help was usually provided by the PO.*

*One nurse educator noted that there was a trade-off in time and effort – one session might take longer to prepare but she now gets back two others inservices from the other sites so it is timesaving overall.*

- Many presenters also found presentations over the system more intimidating.

*“I hate it. It’s so foreign ... like being on TV. Even though I would get asked tougher questions in a unit presentation than over [the system], the telemed presentation is more stressful.” [medical presenter]*

- Participants were also reluctant to be “seen on screen” or to speak in a conferencing situation. Hence the sessions are not as interactive as single-site sessions.

Many interviewees reported that most of the interactions were left to the senior participants, e.g., consultants, CNs, etc.

*“The interaction is more between the Level 3’s ... the others see it as inaccessible.” [nursing]*

But as stated by a ‘junior’ participant:

*“Even if we don’t talk much, we still get to hear the discussion [between the senior people].” [medical]*

- Some people expressed a concern about seeming like the “country cousins” to the bigger centres.

*“It’s stressful for the person presenting, not knowing the audience or how they would measure [the content], being from a rural to a tertiary site.”*

However, there was a general awareness of this potential problem across all sites. Efforts have been made to encourage and value all participation, e.g., by rotating presentation sites, although not always with success.

*MBH nurses were very reluctant to give any presentations over the system, despite encouragement because they felt they had nothing to offer as the tertiary site “should already know it all”. Although this was an erroneous perception, one interviewee suggested that perhaps they were happy to be treated as the “country cousins”. This perception is now changing as MBH nurses become more engaged with their own education sessions and appreciate what they do know.*

Experience with the system, and getting to know people at the other sites has decreased this concern.

### MEDICAL EDUCATION ISSUES

- There are many different forms of medical uses of the system for ongoing education in the ICU domain. All have been expanded beyond the initial three sites to also include other hospitals throughout the state.

- A tutorial programme for residents/registrars.

*This was the RBH programme but has been expanded at the suggestion of the PO to include the other project sites. A consultant from RBH initially facilitated the programme and chaired the sessions. The chairing of sessions is now undertaken by around the presenting site.*

- Rotating Ward Rounds.
    - Rotating Case Presentations / Interesting Case Series.

- Educational uses have also expanded well beyond the ICU domain at each site, involving other domains and sites around the state as well.

*Domains include: Paediatric grand rounds; Cardiac grand rounds; Infectious Disease case studies; Medical grand rounds.*

*Except for the Paediatric grand rounds, all other uses have started up because of the encouragement and facilitation of one of POs.*

- There is an increasing demand for shared medical education.

*The PO is receiving regular requests from yet more sites to be able to participate in the education sessions.*

- Location of the system is an important factor in use.

*The geographical proximity of the TARDIS system to the RBH ICU makes it the system of choice for the sessions, even though the clinicians believe they could get*

*better video and audio for large group, multi-party sessions with another room-based system elsewhere in the hospital.*

#### BENEFITS FROM MEDICAL EDUCATION SESSIONS:

- A direct change to patient management as a result of presentation of a current case.

*An MBH clinician presented a case study of a patient currently in the ICU. Intensivists at one of the other sites suggested more aggressive management options. Within 48 hours, the patient had responded well where they hadn't done so for days on the previous management regime. This is not a case where the clinicians would have thought there was a need to consult outside of their unit.*

- Increased interaction across sites.

*"There's improved communication [between clinicians across sites]. Because we can see each other ... it helps breakdown resistance."*

*Some of the sessions now involve up to 7 sites across the state.*

- Increased sharing of ideas and expertise.

*"This gives an opportunity to present in front of larger groups with different areas of expertise than available here. So you can get alternative input and second opinions."*

*"Similar ideas [about clinical management] start to flow around."*

- Expansion of the referral base, peer networks, and consequent changes to referral patterns.

*One intensivist stated that, as a result of becoming more familiar with other intensivists through the system, he was less reluctant to call and discuss a patient with his peers.*

*"The people at [hospital] asked me to do a locum for them because they'd got to know me through telemedicine [education] sessions."*

*A MBH clinician chose to consult with one of the intensivists at NGH when he otherwise would have consulted with RBH by default: "You get used to talking to them [in the ed sessions] and build up a rapport. You gain a respect for their opinion. [Name] is very knowledgeable."*

#### NURSING EDUCATION ISSUES

- A Nursing inservice programme appears to have been more difficult to sustain than the medical educational sessions. Suggested reasons are noted here:
  - *Logistical problems of organising staff to attend sessions when they have full-time clinical loads and work shift-work.*

*"The nurses are often too busy to take advantage of a session being on."*

*"The nurses are starved for education. We're encouraged to attend [inservice sessions] but we're often too busy to take advantage of them."*

*“[At shift changeover] we don’t do nursing handovers now until after the inservice otherwise people get caught up in [patient care] and don’t make it to the session.”*

- *The reluctance of nurses “to sit in front of a camera”. Nurses also commented about feeling intimidated when there are “15 staff at either end”.*
  - *One person stated that the nurses were more likely to attend an inservice if it was booked on TARDIS than as an in-house session – using TARDIS promoted a greater sense of importance for the session.*
  - *Other contributing factors as to why so few sessions have taken place during 1998 include the change of personnel at NGH; the transition period at MBH with the opening of HBH; and the effective loss of the PO position at MBH to facilitate sessions.*
- There is still room to experiment with the most appropriate content and process for delivering a session. Highly rated sessions could be analysed in this regard.

*A nursing inservice session that received repeated favourable mention in interviews was the inservice with the physiotherapist instructing on how to use a rebreathing bag. The session was hands-on and interactive at each of the participating sites. Participants reported that it was more casual, more enjoyable and people were less restrained in speaking up than in other sessions using the system.*

- Educators are also thinking about how best to measure the educational value of the sessions:

*One educator mentioned satisfaction surveys, and looking at factors such as staff retention and skill achievement.*

#### **ALLIED HEALTH EDUCATION ISSUES**

- Allied Health meetings concentrated initially on support for the physiotherapy management of ICU patients. The sessions have broadened now towards more general physiotherapy inservice.
- Weekly sessions were found to be too frequent and demanding for the rural site. Sessions are now run monthly.

*A tradeoff with the new monthly schedule is that it is harder to remember when sessions are on. At MBH the problem is exacerbated since there is no-one in the PO role to help with reminders and to facilitate sessions. There have also been problems with getting the updated schedules for the sessions.*

- Peer networks have been strengthened and there is increased interaction between sites.

*“One of the values of the sessions is that now we have no real hesitation to phone someone.”*

*The physiotherapist has made very directed calls to both sites on the basis of something she had heard during an inservice indicating they would be able to help with a particular issue/problem.*

## REFLECTIONS ON ALL EDUCATIONAL USES

- Delivery of education across sites offers significant benefits.
  - *Directly for:*
    - *Sharing expertise and resources;*
    - *Distributing preparation/presentation effort;*
    - *Increasing clinician knowledge and skill;*
    - *Expanding peer networks;*
    - *Hence indirectly for improved patient care.*
- Large group, multi-party education sessions are pushing the bounds of desk-top video-conferencing technology more suited to person-person or small group interactions.

*Traditional presentation techniques and inservice processes translate poorly to multi-site video-conferencing sessions. (Despite this, people are universally positive about the value of the sessions.)*

*Ongoing time and effort is needed to continue experimentation to find the most appropriate forms of content and process to best exploit the strengths of the medium.*

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## OTHER SYSTEM USES

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The TARDIS system has also been used in a variety of ways beyond consultation and education, both for formally scheduled sessions and for ad hoc sessions that happen as a result of some other use.

## SCHEDULED SESSIONS

There were a variety of other scheduled uses of the system. Some of these sessions are regular and ongoing. Some were regular sessions for a finite period to meet a specific need. Some were one-off sessions.

- *Meeting of Nurse Educators – were weekly, now fortnightly.*
- *Unit management meetings of ICU CNCs – were weekly.*

*“It takes about an hour. It depends on the clinical needs of the unit. The benefit is not there to make it a priority [to re-instigate regular meetings].”*
- *TARDIS project meetings – were weekly.*
- *Meeting of the Qld. ICU technical advisory group (QICUTAG) - monthly.*
- *Heads of Pathology meeting.*
- *A consultation between physiotherapists at MBH and RBH around a video of a patient examination.*
- *Discussion group for nurses involved in a Grad. Dip. Critical Care Course.*

- *Practice exam vivas in preparation for medical exams.*
- *Education planning meeting for 1998 telemedicine system presentations.*
- *Ambulance officers' meeting with Regional Medical Officer.*
- *Ad hoc education sessions by vendors about a product, e.g., ventilator.*
- *Numerous demonstration sessions and test link-up sessions.*

BENEFITS: There were various reports of the system facilitating sessions that otherwise would not have happened; or could have happened in a less satisfactory and more back-and-forward way via telephone; or that would have involved physical travel between sites.

## NURSE EDUCATOR NETWORK MEETINGS

The Nurse Educator network meetings deserve special mention.

INITIATION: The nurse educators for ICU at RBH and NGH recognised that there would be value in meeting together regularly and decided to set up a weekly meeting involving 5 sites (with educators also travelling from other metropolitan hospitals to RBH to participate).

SESSION ROTATION: They rotated the chairing of the sessions, and the agenda setting, around each of the sites so that 'control' was not perceived to be with one site.

BENEFITS: The comments from participants have been universally glowing in enthusiasm about the value of the sessions:

*"You felt alone before. Even though you had a list of educators around the state, you didn't feel like you could ring them up to ask for something ... you didn't know them."*

*"Being able to see people face-to-face, you feel like you've met them. It's easy then to call them and ask for a [particular learning package]. The information is just flying between the hospitals now."*

*"It's brilliant. It has given us the opportunity to share ideas. I guess we could have done the same thing over phone but we didn't. It would have been a mess."*

*"The major advantages are the personal side of being able to interact with the others, and the sharing of verbal information ... I get so much out of it."*

*"When we finally got to meet at the workshop, we felt like we really knew each other."*

*"We were hanging out together [at the workshop] like old bosom buddies."*

FLOW-ON EFFECTS: The annual Qld. meeting of Critical Care Nurse Educators was held soon after the educators starting meeting via the system. One of the TARDIS POs was invited to address the larger group about how they could exploit the technology to support their roles. As a result of this, and the current participants' enthusiasm about their TARDIS sessions, a statewide network of small groups was established to meet by fortnightly video-conferencing sessions. Processes were also put in place to facilitate the flow of information/meeting outcomes between the groups so that expertise and experiences could be shared as widely as possible.

## AD HOC USES

Formal or scheduled sessions - be they for consultation, education, or other meeting - can be the catalyst for other important interactions between clinicians across sites.

- Clinical education takes place in the process of consulting about a patient, as previously discussed.
- Side issues arise from being able to 'see'.

*"When you can see people, it makes it easier to talk and ask questions."*

*"You can ask questions you wouldn't ask on the phone. There's a different etiquette, ... it provokes different sorts of enquiries..."*

*"I always book an extra 15 minutes or so at the end of the inservice for the chat that inevitably happens at the end." (PO)*

- Being able to see THINGS: "What is that?", or "What does that cost?", or "Why do you do things this way?"

*From a report to the usage mailing list about a consultation: "The most interesting aspect of this [video snapshot of the injury] ... was a new device for securing the patient's breathing tube in place. This started an impromptu discussion on the value of these devices which are to be trialled in Brisbane."*

- Being able to see PEOPLE: "While I've got you on ..." at the end of a session.

*One CNC had a particular 'political' problem to deal with. The CNC used time at the end of some inservice sessions to discuss what was happening with people at other units and see how they handled the issue in their units.*

*People 'catch up' with colleagues that they haven't seen for a while – supporting peer networks, and helping "decrease a sense of professional isolation" .*

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## RELATED USAGE ISSUES

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### TRAINING

The lack of people adequately trained in the use of the system was an issue of concern for interviewees from all sites.

- It is difficult to schedule training in an event-driven environment.

*People in the units are very busy.*

*Making time for training is not a high priority when there are many other competing demands for scarce non-patient focussed time.*

*"It's a nightmare getting staff trained ... a very hit and miss thing." [PO]*

*As a consequence, much training happens on the fly in conjunction with live link-ups.*

*It is often not until someone has been 'thrown in at the deep end' for a consultation etc., that they become motivated to learn how to use the system.*

- There is a high turnover of staff so training is an ongoing issue.
- People do not get to use the system frequently enough to reinforce the training and become familiar with the system.

*“We don’t have the activity on the system to maintain our own skills.”*

- Many people do not have basic computer literacy skills.

*Computer literacy skills are a good indicator of how comfortable someone will be with the system.*

*One of the heaviest users of the system has never received any formal training but found it easy enough to learn through use (as a receiving site only) – “I have a computer at home so I found [the system] relatively easy to understand.”.*

*A lack of basic computer literacy skills, especially among many nurses, is a significant impediment to staff willingness to use the system.*

- The Survival Guide is very rarely referenced to reinforce training or support use.

*People are more likely to refer to their own notes (two interviewees) or to use a peer or PO.*

#### SYSTEM LOCATION

- System location involves trade-offs among accessibility, visibility and ease of use.
  - *Systems at central desk locations can be both problematic and advantageous:*
    - *Problematic because of the background noise, disruption to others if headphones aren’t used, and loss of valuable ‘desk real estate’. There are also potential problems with patient confidentiality.*
    - *Advantageous because of their accessibility and the ease with which others can overhear and potentially participate. Some interviewees also noted that their visibility was a source of pride in the unit.*
    - *“Although the importance of a secondary site at Maryborough for education etc was acknowledged, it was also noted that many education sessions are sent to the ward because the clinicians are too busy to go to a separate room. This way they can at least see parts of the session.” [Project Meeting Minutes]*
  - *The medical tutorials take place via the TARDIS system rather than another system perceived by some to be more appropriate because the TARDIS system is closer to the ICU where the clinicians work.*
  - *More neurological consultations have taken place interactively rather than asynchronously since RBH 4B has acquired its own unit and clinicians no longer need to make their way to 7G ICU.*
- Systems on mobile trolleys allow for optimal sites to be chosen for the use at hand.
  - *A nurse educator always moves the system to a quieter room for the Educator Network meetings.*

- *The system has also been moved for bedside consultations although there are significant issues of adequate lighting, background noise, privacy, and trailing cables that need to be considered.*

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### PIONEERING OF NEW WORK PRACTICES

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Clinicians, and especially POs, are very much aware that they are pioneering new ways of delivering health care.

*“It’s pioneering stuff, learning how to use [the telemedicine system] well.”*

There are many instances where new work practices have been evolved through experimentation with the system for clinical benefits.

- *Optimal scanning settings were chosen after rigorous clinical acceptance testing. However, with ongoing use of scanning ‘in the field’, these settings are being optimised even further to enhance the quality of the scanned image.*
- *The consultation about a burns patient has prompted the PO to experiment with how to get the most clinically acceptable images for future burns consultations.*
- *The POs have also determined through experimentation that video quality is good enough to direct some procedures from a distance.*
- *The POs have also gained experience about the best conditions for bedside video, addressing technical, lighting, sound and privacy issues.*
- *The physiotherapists have worked out that holding the digital camera over a child for an aerial view provides “a brilliant way of transmitting what the child is doing” when consulting with colleagues.*
- *New etiquette has been evolved to facilitate learning and interaction during education sessions, and to deal with the idiosyncrasies of multi-party conferences.*
- *New patterns of interaction are evolving among units and clinicians, and within professional groupings (as previously discussed).*

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### FLOW-ON INFLUENCES FROM THE TARDIS PROJECT

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*“Everyone’s envious. They want one [a TARDIS system] too!”*

There is evidence of a growing web of influence from the TARDIS project at the grassroots of healthcare throughout the state of Queensland, so much so that the borders of the TARDIS project are becoming increasingly blurred.

- New networks of interaction among peers are being established as a result of experience with TARDIS.
  - *7 or more hospitals are now participating in on-line education sessions that started within the TARDIS project (as previously discussed).*

- *A statewide network of small groups meeting over video-conferencing systems has been established as a result of the initiative of the TARDIS nurse educator meetings (as previously discussed).*
- *Rural physiotherapists have started to use videoconferencing [for their Heads of Physios network meetings] as a result of TARDIS.*
- Experience gained from running TARDIS sessions is being passed on to others.
  - *A clinician familiar with TARDIS sessions participated in another video-conferencing (VC) session facilitated by someone who was new to VC. Based on her TARDIS experiences, she could see that it was “a bit of a schamozzle”. Someone from her group facilitated the next session and “did an excellent job”. This person had never used the TARDIS system but had listened to the feedback of peers on how such multi-point sessions were run in TARDIS.*
- The knowledge and experience gained by the POs is being recognised and used.
  - *One PO was invited to be a member on the management board of another telehealth project.*
  - *An existing telehealth system that was not being used is now being put to regular use for satellite nursing consultations between nurses at a Brisbane site and patients who come into NGH for the session. This use only came about as a result of significant effort on the part of the POs to explore with the Brisbane site potential ways to use the technology they already had in place. [This account has not been verified with the Brisbane site itself, although the accounts of the POs concur closely.]*
  - *The POs are being approached by people far and wide to assist with getting video-conferencing established, e.g., to choose appropriate video-conferencing technologies and appropriate sites for ISDN connections.*
  - *They are also frequently asked to facilitate various ad hoc telehealth sessions that may or may not involve TARDIS equipment and/or sites.*

While each influence in its own right seems small, together they have the potential to generate some radical changes in the relationships among sites and clinicians, and consequently in the delivery of healthcare services statewide.

The POs report that the general interest in telehealth is expanding rapidly. Many seeds have been sown over the last two years through discussions and demonstrations and seeing the system first hand. The full impact is yet to be seen.

### ADVANTAGES OF TELEHEALTH

Despite frustrations with technological problems and the relatively early stage in the adoption/learning curve, uses of the TARDIS system to date indicate that telehealth solutions incorporating both video-conferencing and data-sharing capabilities can offer significant advantages for:

- Improved patient management and outcomes, both through direct consultation and through indirect increase of clinician knowledge; and
- Improved networking and knowledge sharing among clinicians.

### REQUIREMENT FOR INTEGRATION OF TELEHEALTH

There are also clear lessons from uses of the TARDIS system to date about the integration of telehealth into everyday healthcare practices, and the pivotal role of a dedicated PO, or similar Support Officer (SO) role, in this process.

- 1) Telehealth is not about technology per se, but technology put to work for some benefit. As such it is **about clinicians, patients and organisations**. It is **about making paradigm shifts in healthcare delivery** and evolving new ways of working and networking.
- 2) There are many aspects that need to be **co-evolved** to make these paradigm shifts and to integrate a telehealth solution into everyday practice for optimal clinical outcomes:
  - *an understanding of real clinical needs and the information required for cross-site interactions;*
  - *the right configuration of technologies;*
  - *the best techniques for utilising those technologies;*
  - *the new forms of work practices that incorporate the technologies in clinically appropriate ways;*
  - *and the political/organisational environment that properly values and resources its ongoing facilitation.*
  - *All this in a site-specific way, yet integrated with other state-wide efforts.*
- 3) The most significant paradigm shifts for consultations start to come about when the POs use a **clinician-focussed approach** that starts with real clinical needs rather than technology.
  - *Identify clinicians who are likely to, or able to, benefit from using telehealth.*
    - *E.g., by making opportunistic use of cases as they arise, or following up on expressions of interest.*
  - *Understand the nature of the information they want to share.*

- *Explore with clinicians clinically acceptable ways to deliver that information.*
- *Explore with clinicians clinically appropriate processes for making use of that information to improve patient management.*
- *Then do it! Evolution only comes about through trial-and-error and critical reflection.*

4) This takes a significant amount of **focussed time, effort and energy**.

*This is consistent with reports<sup>8</sup> from other telemedicine projects suggesting that projects can take 2-3 years to mature and for the technology to become integrated into everyday work.*

5) A **dedicated Support Officer** (as in the TARDIS POs) has a critical role in facilitating this evolution (to be discussed more fully in the following section).

*Many clinicians have stated quite definitely that they can see the potential for telehealth but don't have the time to "make it happen".*

6) Clinicians have to see a clear **clinical/professional benefit** to change the way they do things.

*This is especially so when the system is more complicated than existing media and takes more time than existing consultation processes.*

7) Integrating telehealth solutions as enablers of healthcare delivery therefore involves many **'chicken and egg' problems**.

*To be convinced of the value of the system, clinicians need to see the results of the system in use. For busy clinicians to use the system, they have to be convinced of the benefits for patient care.*

*The potential of the system can only really be uncovered and extended through 'trial and error' use. Trial and error comes about as people start to see the potential of the system.*

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<sup>8</sup> Missouri Telemedicine Network: Project evaluation. Available from <http://www.hsc.missouri.edu/telemed/eval.html>; John Mitchell & Associated (JMA) Discussion Paper on Telemedicine: Topic No. 4: Telemedicine Innovation Process. Available from <http://www.jma.com.au>.

### 3. Project Officer Role

The importance of the Support Officer (SO) role, as performed by the POs in TARDIS, cannot be understated nor underestimated as the essential catalyst for the adoption of telehealth.

*Telehealth is not about technology per se, but technology put to work for some benefit. As such it is about clinicians, patients and organisations. It is about making paradigm shifts in healthcare delivery and evolving new ways of working and networking. The PO role is essential in these regards.*

#### EVIDENCE SUPPORTING THE IMPORTANCE OF THE PO ROLE

There is substantial evidence supporting the critical role played by the TARDIS POs:

- No matter how much potential they see, clinicians agree that they do not have the time, skills, focus or resources needed to make telehealth an integrated part of their work practices.
  - *“We may be enthused but we have to be aware that we still have a full-time clinical workload, patients to look after and so on. We can’t take it the distance on ourselves.” [Allied Health]*
  - *“I can see many potential uses but it’s a matter of someone having the time [to make it happen].” [Clinician]*
  - *“Clinicians don’t have the time, energy or inclination to develop telemedicine in their own areas.” [PO]*
- Many of the uses of the system have been suggested and/or facilitated by a PO.
- The processes and techniques for using the TARDIS system have been developed by the POs through much trial, error, and careful evaluation.

*“We [POs] have learnt a great deal about what works and what doesn’t work with regards to the technology and the social introduction of the technology. ... We are still learning a great deal about the system’s capabilities and the dynamics of the learning curve will be helpful with the coming systems.”*
- The interest and use of the system at the different sites is directly proportional to the visibility and accessibility of the PO.
  - *NGH: Many uses of the system have been initiated from NGH. The NGH PO works from the ICU and has a high profile in the unit and beyond. Many interviewees noted the effective use of the ward communication book for maintaining the visibility of the project and for passing on information.*
  - *RBH: While RBH is the recipient of many consultation requests and an active participant in the medical tutorial programme, the TARDIS project does not appear to have the same profile within the unit as at NGH. The RBH PO’s time has been torn between general project tasks working from the main office and the more focussed project promotion activities in the clinical areas - “I can’t always be there to follow up and stimulate other activities.”. The lack of project*

administration support has been an important factor.<sup>9</sup> The PO has played a key role though in the clinical evaluation of technology configurations.

- *MBH: Despite the stated needs, minimal use is being made of the TARDIS system. The MBH PO was only employed part-time in the beginning. Even this was difficult to sustain as she performed a senior clinical role for the other time so there was always the potential for role confusion and competing demands - "The PO needs to be full-time. It's difficult trying to run the unit and do project work."*

*For most of 1998, there has been no-one filling the role, to the frustration of all MBH interviewees. One clinician who has used the system before has become the 'pseudo-PO' to his annoyance, and to the detriment of his other work. (MBH issues will be discussed more fully Section 4.)*

- All interviewees talked about the important role played by the PO or, in the case of the MBH clinicians, the ways in which the PO role has recently been missed (to be discussed more fully in Section 4).

*Clinicians variously talked about the PO doing the following:*

- *providing training in how to use the system;*
- *helping with the set-up of equipment for consultations and other sessions when possible;*
- *being available to help with technical problems;*
- *helping to set up the session schedules;*
- *communicating session schedules, and reminding people closer to the time;*
- *keeping people interested in telemedicine;*
- *helping with the political lobbying to acquire more machines and human resources for telehealth.*

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#### SKILLS USED IN THE PO ROLE

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The TARDIS POs needed a variety of skills. These are skills that would be required in filling any similar telehealth SO role:

*"POs have skills and knowledge base that clinicians can't afford to have."*

*"POs are especially important when we don't have the activity on the system to maintain our own skills."*

- Good computer literacy and some technical skills;
  - *To facilitate the placement and connection of equipment;*
  - *To understand the technology;*

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<sup>9</sup> The size of the RBH campus and the potential to exploit telehealth as a tertiary centre suggests that more than one PO role could be required.

- *To explore how to best exploit the potential of the technology;*
- *To troubleshoot when problems arise;*
- Clinical skills (or at least a very good understanding of clinical issues);
  - *To identify potential uses of the technology, i.e., to understand what sort of cases and circumstances could benefit from telehealth and how;*
  - *To help develop techniques and processes to meet clinically acceptable standards, e.g., what image quality is needed for diagnosis;*
  - *To be the patient advocate:*
    - “I see the potential of the system for saving lives.”*
- Interpersonal skills;
  - *To teach, encourage, suggest, and facilitate;*
    - “You can’t impose the system on people. You have to take a softly softly approach.”*
    - “There’s a lot of leg work and PR”*
    - “You have to be a salesman.”*
    - “Encouragement to use the system must be gentle to avoid adverse reactions and negative perceptions.”*
  - *To manage perceptions, respond to frustrations;*
  - *To foster local interest and identify local opportunities;*
- Political skills;
  - *To network and build relationships;*
  - *To identify who should be approached, and how, when and for what;*
  - *To promote what good has been done, and maintain the project profile in general;*
  - *To lobby management for recognition and resources; to demonstrate the system;*
  - *To build up a reputation and credibility.*
- Administration skills;
  - *To follow up on usage evaluations*
  - *To monitor/record system uses (and numerous other administration duties since the project has not had any official administration support)*

#### SKILLS AND PROJECT PHASE:

The PO role changes as the project evolves. Different skills are needed in different project phases.

- *TECHNOLOGY ACQUISITION PHASE: getting the technology in place, learning how to use the technology, and developing clinically acceptable techniques; building up relationships with other POs and the rest of the project team; .*

- *EARLY IMPLEMENTATION PHASE: training clinicians in the use of the system; promoting the availability of the system; facilitating sessions; facilitating and exploring various uses of the system;*
- *CURRENT PHASE – ONGOING IMPLEMENTATION: “still a combination of facilitation, education, promotion, and support ... and refining and developing techniques and skills ...”*

The ultimate goals of the POs are that the technology will be relatively stable, that telehealth will become integrated into normal healthcare practices in the same way that the telephone is today, and that the PO/SO role will become one of facilitation and coordination.

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#### DEVELOPMENT OF SO ROLE & SO NETWORKS

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The POs had definite suggestions for how the support officer role should be evolved and supported.

- A dedicated full-time site-wide SO with a good understanding of clinical issues is needed at each site.

*Regarding the SO position within the organisational hierarchy: the POs were concerned that their role not be closely aligned with any professional group, so that cross-discipline credibility could be maintained, nor to be closely aligned with the IT department, so that their clinical credibility could be maintained.*

- The SO should be the primary point of contact to facilitate/coordinate all telehealth uses at the site.

*This implies that sites have coordinated processes for handling telehealth rather than the ad hoc project-based approach that is currently the case.*

- SOs across sites should form part of a wider coordinated telehealth effort.
  - *One suggestion was to “provide a tiered support system with unit-based facilitators, institution-based managers and coordinators [and then] wide-area referral and coordination services for education, consultation, and networking”, and the development of shared protocols.*
  - *Another was to establish a state-wide clearinghouse for telemedicine, e.g., to set standards, and to coordinate ‘experts on call’ for the whole of the state for on-line consultations.*

# 4. Perspectives

The perspectives of the different hospital sites and professional groups involved in the TARDIS project are also worth considering.

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## SITE PERSPECTIVES

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### RBH

As a tertiary hospital, RBH is the main referral/consultation centre. It has also been the locus of much of the central project management and the technological experimentation activity (with help from NGH).

*RBH-specific issues identified by interviewees included:*

- *The need for increased visibility and availability of a PO at the unit level for training and to promote clinical use;*
- *Extension of the telehealth network to support other major referral patterns, e.g., Lismore and Toowoomba hospitals for neurological consultations.*

### NGH

As the site with the most dedicated PO time and strong support from the head of the unit, NGH has been a major user of the TARDIS system.

*NGH-specific issues identified by interviewees included:*

- *The potential to use of NGH as a referral centre since it is well resourced with Intensivist expertise;*
- *Extension of the telehealth network to include the satellite hospitals in the district;*
- *Acquisition of a machine for DEM (in progress)*

### MBH

The TARDIS system at MBH has been significantly underused despite the perception and belief of many that it had the greatest need.

*“Why didn’t we use it for consults when we said we needed it?”*

*“We know we’re not using it to its full potential.”*

#### WHY HAS THE SYSTEM NOT BEEN PUT TO MORE USE AT MBH?

There have been many factors impacting on MBH during the project period, as identified by interviewees:

- The PO position was only part-time.

*The person filling this role was also the CNC of the ICU. It was difficult to fully devote the time to the project on project days when people still saw her around the unit. The PO started using a strategy of wearing civilian clothes on her TARDIS days to reinforce the role separation. This did help to some degree.*

- There were no supernumerary nursing staff as in the other units to assist with consultations when the need arose.
- The unit was extremely busy for a long period of time and opportunities for training were limited.

*Staff were feeling stressed and overworked. Learning how to use the TARDIS system or thinking about telehealth were very low on the priority list.*

*If the unit was quiet when there would be opportunities to become familiar with the system, nursing staff were often re-deployed to other areas of the hospital.*

*“There’s not a lot of energy left at MBH to think of things they can do [with the system].”*

- The dominant referral pattern for the unit was for cardiac cases to PCH, not to RBH.
- MBH had medical expertise in many areas.

*“We have huge specialist staff here so I don’t need to consult outside much.”  
[Jnr. Clinician]*

- For most of 1998, there has been significant upheaval in the unit with the establishment of Hervey Bay Hospital (HBH) and loss of the PO role
  - *Many experienced staff were moved to HBH; new staff moved into the unit.*
  - *The person playing the PO role was moved to work on establishing HBH.*
  - *The new CNC of MBH ICU did not have the time, priority nor computer-literacy confidence to take on the PO role.*
  - *“There have been no consults from MBH since [PO] left, and almost no nursing education. The medical education is progressing though.”*
  - *There is no official person on site to handle technical problems when they arise with the system. People either call a PO at another site, or call a clinician who has had some experience with the system (pseudo-PO). The ‘pseudo-PO’ clinician is becoming frustrated with this unofficial role impacts on his work.*
- Rapid turnover of medical staff makes it difficult to develop a pool of people proficient with the system.

*“You show the [junior staff] twice how to use [the system for education sessions] and they’re right to do it on their own. But then they leave and you have to show someone new all over again.” [Pseudo-PO]*
- Facilitation of education session from outside of MBH often resulted in communication breakdowns.
  - *The medical education and physiotherapy sessions that did progress were driven from outside MBH.*

- *Because there was no PO to facilitate and organise sessions, there were frequent reports of breakdowns in communication where MBH staff did not receive a program, or someone forgot they were due to give a presentation.*
- *“There’s no PO to coordinate or facilitate [the med ed sessions]. A couple of times, the presentation dates have been changed and no-one has let us know.”*
- Because of the low usage rate of the system, people did not get to use the system often enough to maintain their skill levels.

#### A WINDOW OF OPPORTUNITY FOR THE FUTURE AT MBH/HBH?

Despite these problems, there is still a considerable degree of interest and enthusiasm for how telehealth can be incorporated into care at MBH.

*“We can see it’s potential. ... The biggest limiting factor is the lack of people with the skills and techniques ... I’d hate to see us lose it or not use it to its maximum.”*

*As HBH becomes more settled, there appears to be more energy now for thinking about telemedicine.*

- Many interviewees identified support for interactions between MBH and HBH is an important window of opportunity to exploit the potential of telehealth.
  - *Medical rounds between units*
  - *Allied health staff meetings*
    - *Allied health were particularly enthusiastic and forward thinking about how they could make use of telehealth to promote communication and interaction among peers across sites and to support clinical care.*
  - *Nursing inservice sessions*
    - *“Nurses at MBH are starved for education.”*
    - *There is a change in nursing culture where the new nursing administration are putting more value on ongoing education and are prepared to give more resources for education.*
    - *Currently there is one temporary position between both sites to help with ‘up-skilling’ of the new staff in the two units.*
    - *Sharing inservice sessions over the system would maximise use of a scarce time resource since the educator would not need to repeat a session at each site.*
    - *Now that the nurses have started receiving education sessions, they understand more about ICU work, are less intimidated, and are becoming interested in even more education.*

*“Now that they know a little, they want more.”*

- All interviewees stated that the appointment of a full-time telehealth PO for the district was critical if this potential was to be realised.

*They saw the need for someone to act at an organisational level to lobby for more telehealth equipment and resources across sites, and to be available on the ground for trouble-shooting and facilitating sessions.*

- Interviewees also identified the need for more systems in more locations to make the network usable.
- Coupled with this was a frequently stated frustration with the lobbying processes needed to argue for such systems.
- One medical clinician also wants to test the possibility of sharing interesting cases between MBH and a Brompton hospital in the UK.

### SHARED ISSUES ACROSS SITES

Negotiating effective relationships with the hospital IT services, and with other non-TARDIS telehealth projects within the sites, has been an issue at all sites. Efforts are ongoing in these regards.

The lack of interoperability between the TARDIS system and existing IT infrastructure, e.g., HBCIS, in the units is also an issue for some people.

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## PROFESSIONAL PERSPECTIVES

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### MEDICAL

Medical clinicians have the better opportunities to use the system because of the style and nature of their work. Telehealth is also perceived as offering the greatest benefit to medical work.

### NURSING

Level 1 and level 2 nurses have the least opportunities to use the system because of their clinical workload and the high-dependency nature of their work.

*“Level 1 and 2 nurses are often too clinically pre-occupied to think about telemedicine.”*

Level 3 nurses have the greatest opportunity to use the system.

*They tend to work in a supernumerary capacity and more likely to be involved in consultation sessions. Many nurses also saw potential for the system to support quality assurance (QA) activities across sites that are usually performed by Level 2 or 3 nurses.*

### ALLIED HEALTH

Allied Health (physiotherapy) see great potential for the system to support peers in remote locations or at sites without access to specific expertise. However, their full clinical load makes it difficult to realise this potential.

# 5. Benefits, Barriers and the Future

In this section, we summarise the benefits, and barriers - technological and organisational/human - to the adoption and integration of telehealth. We also outline directions for the future based on interviewee suggestions.

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## GENERAL BENEFITS

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Experiences in the TARDIS project indicate that telehealth can provide substantial benefits for healthcare delivery throughout Queensland.

### TANGIBLE/MEASURABLE BENEFITS:

- Reduced patient transfers to tertiary centres and
- Improved patient management and morbidity
- Decreased patient travel in general for appointments/follow-up
- Decreased clinician travel between sites for meetings

LESS TANGIBLE/MEASURABLE BENEFITS, yet potentially having the greatest long-term impacts on healthcare delivery:

- Evolution of new work practices
- Significant expansion and strengthening of peer networks
- Changed referral/consultation patterns
- Development of clinician skills and knowledge
- Increased confidence in management decisions
- Sharing of expertise across sites
- Evolution of ways of using the technology to acceptable/optimal clinical standards

### OPEN ISSUES:

- What are the medico-legal implications of giving advice over the telehealth system with shared access to data?
- How should clinicians/sites be remunerated?
- What are the trade-off effects of work versus benefit of system use?
- What are the staffing implications, e.g., for having appropriately skilled staff to take calls, or to care for patients who would otherwise be transferred?

- What are the cost implications of the consequent re-distribution of healthcare delivery – for individual cost centres within sites, for the participating sites, for ancillary services, for QH in general?
- How do you measure the less tangible benefits?

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## BARRIERS

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### TECHNOLOGICAL BARRIERS

- Unreliable technology.

*“When asking someone to trust something new, consistency is paramount.”*

- Poor/variable audio quality.

*People demonstrated that they were quite adaptable to audio delays and the video image size but not to poor audio quality.*

- Technology that is perceived as complex to use, e.g., the scanner.
- Pushing the limits of desktop videoconferencing for large group, multi-site sessions.
- The annoying delay between audio and video switch in multi-party sessions.
- The non-intuitive way of synchronising scrolling of shared images.
- When time and effort to use the system outweigh perceived return benefits.
- When the project is not perceived to be exploiting the best technology available (a comment made by several interviewees).

*“It seems to have ground to a halt about 12 months ago. I know that there is better software available (I’ve seen it demonstrated), but TARDIS doesn’t seem interested in following any of it up. Don’t know why ??”<sup>10</sup>*

*Another comment was to do with a system better suited to inservice education. This raises the issue of competing demands on the system – a best-fit system for education might not be best suited for consultations.*

- When promises of better software fail to eventuate, i.e., become ‘vapourware’.

*There was an expectation that code was being developed to automate part of the scanning process. This never eventuated. There was also a promise that new software would solve many of the audio problems. This was not the case.*

- “The implementation has not been as easy as expected.”

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<sup>10</sup> This is more a problem of perception than reality. The system referred to in the quote was the ‘Voyager’ system. Attempts have been made at the project management level to evaluate this system but without success to date. The comment does indicate then that more explicit effort might be required to communicate such project aspects to the key clinicians.

*There is a concern that people have been tolerating the “technology being infantile and falling over all the time” because it is a trial project, but that this tolerance may be reaching its limit.*

- Lack of integration with the ‘mainstream’ hospital computing environment.
- Lack of inter-hospital networks matching dominant referral patterns.
- Software incompatibility, e.g., inability to share data across the network.

#### **ORGANISATIONAL & PEOPLE BARRIERS**

- Lack of commitment from management to support with resources, i.e., funding for people resources.

*“We’re not sure whether there will be funding [for telehealth]. That’s the trouble when things are valued by economics and not patient care outcomes.”*

- The belief at management level that it is enough “to throw technology at the problem” but not people.

*“It’s not enough to throw technology at the problem. Clinicians HAVE to be involved in appropriate ways to develop how the technology will be used. Getting on board and involved requires a lot of work.”*

- Inadequate PO/SO support.
- The belief that a PO or support officer role is only to do with technology/trouble-shooting support (rather than with clinician support to explore clinical use).
- The realities of healthcare ‘on the ground’.

*“The clinicians at [another rural hospital] are having problems getting a feeding pump to do their normal work let alone a telemedicine system.”*

- Multiple independent telehealth projects on the one site.
- Ongoing education insufficiently valued and, more importantly, inadequately facilitated and resourced.
- Narrow clinical ownership.
- Inadequate promotion to the ‘grass-roots’ clinicians of the potential uses of the system.

*“I wouldn’t have known about [the system] unless [name] hadn’t overheard and said something.” (leading to a consultation via the system with significant patient benefits, and time and cost savings)*

- The perception that existing processes work well enough often enough.
- Fear of technology.
- Poor computer literacy skills.

- Fear of sitting and talking in front of a camera.
- Increased work and stress to present (education sessions) over the system.
- Inadequate time, energy, resources and skills to do the work “to make telehealth work”.
- The difficulty in training staff and the low frequency of use to reinforce the training.
- The scarcity of people with adequate skills and knowledge of the system, e.g., through staff changeover, either by rotation or attrition.

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## THE FUTURE OF TELEHEALTH

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### DRIVERS

- Real clinical needs
- Real benefit to patient care – either directly or indirectly

### ENABLERS

- Reliable, functional, easy-to-use technology
- Adequate PO support and broad clinical ownership
- Supportive organisational culture
- Critical mass of sites with compatible technologies

### FUTURE USE/IMPROVEMENT SUGGESTIONS FROM INTERVIEWEES

Interviewees made numerous suggestions for how telehealth could be used and extended to benefit healthcare delivery.

The range and variety of these suggestions indicate the enthusiasm and vision clinicians have for the application of technology to healthcare, even if they do not have the time (under current circumstances) to make it happen.

#### *TECHNOLOGY:*

- *Scanning needs to be made simpler.*
- *The technology needs to be more reliable.*
- *Better audio/video.*
- *“Audio which is low cost, full duplex and requires minimum/no setup and cover a small conference room.”*

- *“A more robust bullet proof technology, simple user interfaces, intuitive design for the infrequent user. Automated configuration ... on startup and auto-loading of configurations for different applications.”*
- *More games!*

#### CONSULTATIONS:

- *Enable patient details to be recorded with scanned and saved images*
- *Store details of the clinician requesting consultation to help with follow-up*
- *Use the system to talk through procedures*
- *Broaden the clinical usage beyond ICU*
- *“Evaluate broader clinical applications – would management, bio-medical assessment and interventions, neonatal consultation...”*
- *Make it easier to take to the bedside, e.g., “no power cables to worry about”*
- *Extend the telemedicine network to include:*
  - *“Every ICU/CCU/A&E in Qld! – a state critical care network?”*
  - *“any small country hospital that handles gross medical emergencies”*
  - *emergency and retrieval teams, e.g., attending MVAs*
  - *underground mining sites to support medical emergencies that happen there*
  - *GP training as ISDN becomes more available*
  - *plus specific hospitals as noted below.*

#### EDUCATION:

- *Provide more appropriate technologies for multi-site large-group presentations.*
- *Make (and make available) videos of presentations and rare procedures.*
- *Give presenters a lapel microphone to help improve the audio quality of presentations.*
- *Develop and make use of intranet-based clinical and educational materials.*

#### PROJECT RESOURCING/PROMOTION:

- *Promote applications not technology.*
- *Better processes for promoting the use of the system, especially with staff rotation/changes*
  - *Suggestions included presentations at lunchtime meetings, including the system in orientations for new staff, etc.*
- *More demonstrations to clinicians (rather than just politicians and administrators) to sell the potential uses of the system.*
- *Better organisational support for resourcing telemedicine, i.e., for both technical and human resources.*
- *“Integrate telemedicine technical and clinical support within the existing IT departments.”*

- *A full-time site-wide PO (SO) at each site recognised as a position in its own right responsible for all telehealth applications.*
- *One suggestion was to “provide a tiered support system with unit-based facilitators, institution-based managers and coordinators [and then] wide-area referral and coordination services for education, consultation and networking.”*
- *Help with political lobbying to convince management to invest in telemedicine*
- *“We may be enthused but we have to be aware that we still have a full-time clinical workload, patients to look after and so on. We can’t take it the distance by ourselves.”*
- *“Develop strategies to ensure the ongoing growth and development of clinical application of telemedicine.”*
- *A state-wide clearinghouse for telemedicine, e.g., to set standards, and with experts on call for the whole of the state for on-line consultations.*

**RBH:**

- *Facilitate telemedicine capabilities for Lismore and Toowoomba hospitals since they are major sources of referrals and work.*

**NGH:**

- *Use telemedicine capabilities to support administration functions.*
- *Another system in DEM.*
- *Systems for other hospitals in the district to redirect consultations from Caloundra and Gympie to NGH instead of to RBH or PAH.*

**MBH:**

- *The most common suggestion was for a full-time PO between MBH and HBH.*
- *People at MBH saw great potential for telehealth between MBH and HBH:*
  - *Shared nursing inservice sessions*
  - *A system in HBH ICU for consulting between units*
  - *Clinical consultations and rounds*
  - *Allied health staff meetings.*
- *A telemedicine system for PCH for cardiac consultations.*

**MEDICAL:**

- *Develop models of funding and reimbursement.*
- *Support the ANZICS ICU database collection.*

**NURSING:**

- *Use the telemedicine to support CN ‘portfolios’ across sites.*
  - *Specific suggestions were to support QA activities such as benchmarking, WH&S, infection control measures, sharing relative satisfaction surveys, development of procedures, discussion of study results etc.*

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## REPORT CONCLUSIONS

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- The TARDIS project has been successful in demonstrating that telehealth systems incorporating both video-conferencing and data-sharing capabilities can be used to generate significant benefits for patient outcomes and clinician support networks.

*In fact, the more significant and longer term benefits for Queensland Health appear to be in the less tangible area of expanded clinician networks.*

- Telehealth activities at the sites involved in the TARDIS project are now at a critical stage.

*MBH is at the most critical stage, and with the greatest need.*

- Significant effort has been expended in laying the groundwork for the use of telehealth.
  - *Fostering the organisational/political culture in which telehealth can be explored;*
  - *Building up relationships with clinicians and fostering their interest;*
  - *Experimentation with technologies and evolved work practices.*
- Understanding that change takes time, there is evidence across the sites that the paradigm shift to integrate telehealth into everyday practice is starting to happen with more widespread experimentation and adoption of the system for clinical and clinician support.
- The next 12 months will be a critical period for working with this enthusiasm and moving beyond the experimentation stage to the point where telehealth is integrated into normal clinical practice.

*This is consistent with reports from other telehealth projects (Mitchell, Missouri).*

- Further change requires top-down organisational support to resource not only the technology but, more importantly, the human and cultural aspects of change.
- Ongoing change also requires the time and commitment of clinicians to explore how the technology can be used to support patient care.
- A dedicated SO with a clinical focus is critical to the ongoing facilitation of change.

*The SO can also provide a primary point of contact for coordination of all telehealth activities at a site.*

- Expanding the number of networked hospitals across the state (with compatible data sharing as well as video-conferencing capabilities), reflecting key referral patterns, is also critical for realising the full potential of a telehealth network for Queensland Health.

*Key referral patterns need to be better understood and analysed.*

## RECOMMENDATIONS

*KEY RECOMMENDATION: That resources be made available for telehealth at each site, most critically in the form of dedicated clinical support officers, to build on the foundation laid by the TARDIS project and to facilitate ongoing adoption, co-adaptation and integration of telehealth into everyday clinical practice.*

SUPPORTING RECOMMENDATIONS to broaden use and ownership of the system are:

- That work continues to actively promote and explore more clinical uses of the technology with clinicians.
- That work continues to explore technological options that are stable, reliable, easy-to-use, and, ideally, integrated with existing hospital IT infrastructure and the broader telehealth network.
- That more access points to the telehealth network be made available within sites.
- That the telehealth network between sites be expanded to reflect key referral patterns.