# Telehealth standards directions for new models of care

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## Abstract

This paper presents recent moves in Telehealth standards development which extend the scope of various patient-oriented modes of interaction. Telehealth is usually seen as a means to deliver existing clinician-based health services at a distance. We describe a new broader view based on a framework for identifying technical or application elements making up a Telehealth activity, rather than treating it as a variation of an existing specialised clinical process. This approach provides freedom to define new Telehealth-enabled patient-centred models of care. Examples are given of Telehealth activities based on this framework, which are suited to rural health care settings.

## Introduction

Telehealth (or telemedicine) refers to the delivery of health services in circumstances involving separation in location and/or time, using Information and Communication Technologies (ICT)[1]. This approach has long been advocated for improving the quality and efficiency of health services delivery, especially in regional, rural and remote situations. Conventionally, Telehealth is seen to involve human-human interactions such as physician-patient medical consultation, usually enabled through media such as e-mail, telephone and point-to-point video-conferencing. This view concentrates on existing forms of activities between health service providers and their patients being delivered interactively at a distance, through such means as teleconferencing.

Different models for these interactions have been developed by various clinical specialities (e.g. telepaediatrics[2]) and in various clinical service settings (e.g. telehomecare[3]). The models are often simple variants of underlying health service activities, still centred on the roles of physicians undertaking the activities. Two restrictions occur on wider use of Telehealth when such models are adopted. First, a clinician-oriented (or clinical process oriented) model for Telehealth activities is difficult to adapt to cater for new models of care. Second, modelling according to clinical speciality instead of more generally, limits adoption of Telehealth practices by other specialities.

In view of these restrictions, it is understandable that there are few widespread clinical process standards in place which are directly applicable to Telehealth activities[4]. For example, some emerging forms of interaction which may require standardisation include:

- multiparty interactions: e.g. care team planning sessions, multidisciplinary team diagnosis, multisite (patient/physician/specialist/nurse/carer) consultations;
- augmented interactions: e.g. portable medical device inputs, haptic/tactile sensations, telepresence/realism enhancements, critical care situations;
- automated or virtual interactions: logging of patient data by ambulatory monitoring, smart environment devices, home telehealth stations, patient surveillance.

Recently the Standards Australia IT-14-12 Subcommittee on Telehealth undertook a review of the standards space and proposed a framework for further standardisation development in Telehealth[5]. The framework emphasises the two domains in which relevant standards can exist: technical and applications. Within each domain, it provides an environment of successive refinement according to major elements of that domain which allow appropriate standards concepts to be expressed contextually[6]. The remainder of this paper describes the framework in more detail and provides examples of how it might be useful to define new Telehealth-enabled patient-centred models of care which are suited to rural health care settings.

## Telehealth Standards Framework

A natural way to divide up the space of Telehealth is to recognise that there are two considerably different "applicability" domains which have fundamentally different views of what constitutes the characteristics of interest in a Telehealth system:

- the "**Tele**" domain which covers **technica**l scientific and engineering characteristics (e.g. data or equipment aspects including software, connectivity, human factors);
- the "**Health**" domain which covers clinical **application** aligned characteristics (e.g. health care processes and systems including consultations, followup, care management).

Within these two primary domains, we identify functional stages corresponding to the sequential aspects of activities in a domain. In the "Tele" domain, the functions deal with stages in the handling of data during a Telehealth process, while in the "Health" domain, they deal with stages of severity and complexity of intervention in the treatment of patients. Each of these functional stages is then further described in terms of more fundamental component tasks. The table below provides a map of the existing and potential standards space using this taxonomy[5].

| DOMAIN | FUNCTION | COMPONENT |
|---|---|---|
| Tele / Technical | Capture | Physical Characteristics e.g. colour, measurements<br>Device Types e.g. audio, image, video, sensors |
| | Storage | Compression e.g. JPEG, MPEG<br>Content e.g. regions of interest, physiological signals |
| | Transmission | Coding e.g. protocols, packets, errors |
| | Processing | Transforms e.g. scaling, noise |
| | Quality | Display e.g. screen properties<br>Observer e.g. subjective opinion |
| Health / Application | Assessment | Clinical guidelines<br>Screening/consultation<br>Telepresence/robotics |
| | Diagnosis | Reporting guidelines<br>Remote testing and imaging<br>Decision making and expert consultation |
| | Treatment | Prescribing and medication<br>Formulation of care plans |
| | Management | Execution and modification of care plans<br>Coordination of multiple carers |
| | Monitoring | Recording from medical devices<br>Messaging/terminology<br>Analysis of data, images, signals<br>Carer-patient e-mail/web usage |

To describe particular instances based on the above taxonomy, we also need to specify usage and performance characteristics for Telehealth processes. First we consider various health data handling steps at which different Telehealth interventions are possible:

- Patient data gathering by observations and devices (including images and test results)
- Patient data transfer between health personnel and/or computers (including messaging)
- Patient data aggregation and summarisation to exclude redundant details
- Higher level information extraction from data for use in supporting clinical decisions
- Communication and followup between health parties on clinical decision matters
- Finding clinical evidence from patient data to support population and longitudinal studies.

For example, observations made by the consulting clinician during a telepaediatrics session may constitute data gathering; discussion of the chronic disease management approach needed for the patient with other members of the care team may be seen as communication and followup.

Next we must consider various modes of participant action or interaction between the parties in a Teleheath process:

- Patient Self-care mode, where there is solely patient-computer interaction and the computer software provides advice and information;
- Carer-Patient and Clinician-Patient mode, where there is some Telehealth based patient-computer (or patient-clinician-computer) information gathering aspect, and some Telehealth based interactions between one or more health care professionals and a patient;
- Clinician-Carer and Clinician-Clinician mode, where there are Telehealth interactions between health care personnel for the purpose of managing the delivery of health care services to a patient.

In addition to the above concepts, we need to specify some details of the structure or operations of the supporting technology for the particular Telehealth interaction. Some of these details are:

- Timing: whether the Telehealth interaction takes place in real-time (synchronous) or separated in time (asynchronous or “store-and-forward”);
- Medium: how the interaction is conveyed, such as by voice, video, signals;
- Mechanism: which type of capture and presentation devices are used for the interaction, such as a videoconferencing unit, webcam, PDA, wearable sensors;
- Channel: which telecommunications means is employed to deliver the interaction, such as broadband, network, wireless;
- Performance: how the operational criteria for the interaction are specified, such as reliability, affordability, quality-of-service;
- Human: how the user related aspects of the system are specified, such as realism, useability, acceptability.

This is an aspect in which Telehealth must fall back on the more general engineering or scientific foundations of the Health Informatics operational environment in which it exists.

## Examples of telehealth activities

Two examples will be given here of approaches to new models of care relevant to rural health care, which rely on some level of standardisation as described above. The examples will be discussed using the taxonomy and associated descriptive aspects. While in each case there is currently no related major standardisation effort in progress in Australia, they are both good candidates for such attention. International standardisation efforts are under way through the ISO to define quality criteria under which telehealth processes may be required to operate, which may impact on these.

The first example is of **home-based health care**. Much effort is currently being invested in this area, with an expectation that telemonitoring of a patient's personal situation, including changes in health condition, response to medication and treatment, and adherence to care plan or chronic disease management routines, will increasingly be achieved by Telehealth means[7]. Two distinct advantages over traditional practitioner-centred health care are offered by this approach. First, the availability of a richer set of information, with more variables and sampled at a more frequent rate than could be achieved if patient attendance was required, allows much better quality of decision making in the care program, and allows this to individualised to cater optimally for the patient. Second, the patient is more fully engaged in the process of assuring delivery of their own care, and so likely to be much better informed and compliant with care plan details.

A Telehealth approach to home-based health care would have a number of components. It would commence with **gathering** patient physiological information using sensory devices (or ultimately perhaps a "smart home" environment), and feeding this to a summarisation computer program for **aggregation** and **extraction**, followed by conveyance of reporting and advice **decisions** back to the patient. In the Health domain, this approach constitutes **monitoring**; in the Tele domain it covers most functional areas. The types of standardisation that might be required here would therefore be better linked with the Health domain: for example, one could envisage specifying what types of physiological data should be collected. The activity is inherently linked with a **patient self-care** mode of action, and so the design of the application would be based on appropriate models for this. This would allow health service providers to cater for a large number of geographically dispersed patients who lack urban ease-of-access.

The second example is the development of **Personal Health Records (PHRs)** which would enable individuals to understand and manage their own health information environment and provide them with their own whole-of-life microcosm of health records and planning[8]. While potential elements for PHR content standards are under discussion, there has been little progress in defining standards environments in which they might be captured, updated or exchanged with other health data repositories. Current thinking on national health record policy in Australia includes the concept of patient-held records in its ambit, and this suggests that in the future such migration of data from primary care and acute facilities to the patient will occur. This area holds much promise for boosting awareness and participation in wellness and preventative health programs, as well as for patients in early stages of chronic conditions.

Telehealth support for individuals maintaining PHRs might be provided through a web-based software package which could also contribute to personal health promotion/education, and lifestyle choices. (Several such packages area already being provided by major computer hardware and software companies). A related Telehealth based activity might be the use of a remote data repository and software tool set, so that individuals could systematically work through their personal health histories using the application to access their other stored data securely, and to manage or prompt them intelligently in that process. In the Health domain this constitutes a **management** activity, while in the Tele domain it is a **storage** activity. Again this is a **patient self-care** mode of operation, and involved

chiefly data gathering phase actions. The anticipated opportunities for standardisation would therefore be aligned with the way in which a patient could most efficiently and intelligibly proceed through the data space, allowing personal variation to the sequence of tasks rather than enforce a rigid "form-filling" kind of approach.

These two examples underline the importance of empowering the patient by enabling access both to data and to the processed or interpreted results derived from that data. In both cases, a higher level of care could be achieved by making use of the richer personal data now available for that patient, to customise and adjust their health care regime. In practice it is difficult to imagine that such systems could be set up at once without a need for human oversight or intervention. This opens a promising new door for Telehealth, in the same league as the health call centres which have proliferated, in the form of health expertise portals and health coaching.

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## Presenter


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