Australian Government

Department of Health and Ageing

Telehealth Technical Standards Position Paper

Draft for Consultation

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Telehealth Technical Standards Position Paper

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1 Purpose of document

1.1 Document scope

This work has been prompted by the commencement on 1 July 2011 of thirty-four new item number MBS rebates relating to particular referred consultation services delivered by video consultation between patients (with or without primary care clinicians and/or other supporting healthcare professionals in attendance) and specialists, psychiatrists or consultant physicians.

It seeks to address the question of whether existing industry developed technical standards are adequate to enable these services to be performed.

This document provides a summary of the current standards environment within which the new MBS rebates operate, and discusses how video conferencing can be deployed operationally to support the MBS rebates. The document does not focus on the broader scope and opportunities of telehealth that may be possible with the advent of new and more powerful telecommunications technology, such as the National Broadband Network (NBN). The focus is on technical standards, by which is meant specifications (e.g. formats, procedures) which dictate specific elements of data and operations concerned with the utilisation of ICT equipment and software in video conferencing systems.

The document is targeted to address macro level issues in implementing the physical and logical ICT environment needed to support the clinical functions covered by the new MBS rebates, specifically two-endpoint video consultation using video conferencing. The work is intended to provide background information for use by the National E-Health Transition Authority (NEHTA), the Department of Health and Ageing (DoHA), and the Department of Broadband Communication and the Digital Economy (DBCDE). It is expected to provide input to further discussions on addressing future technical and clinical needs and to set the scene for broader follow up projects of work if required.

1.2 Acknowledgement

The efforts and input from NEHTA as well as the standards community in the research and preparation of this paper is appreciated and duly acknowledged.

1.3 Specific deliverables

- Develop a telehealth standards position paper that is essentially a stock-take of the standards required and available to support those telehealth services that fall within the scope of services eligible for the new MBS rebates applying from 1 July 2011.
- Describe the services that are eligible under the rebates.
- Describe the range of tools and infrastructure that will enable those services to be delivered, including their capabilities, fit for purpose, degree of interoperability, benefits, and limitations.

- Comprehensively set out the existing technology and communications standards that underpin and enable those tools and that infrastructure to be effective for the purpose of supporting the eligible services to be delivered, including description of gaps or limitations (if any) in those standards as being fit for that purpose and recommendations for improvement if required.
- Describe, at a high level, the nature of any complementary desirable requirements to support the effective delivery of those eligible telehealth services, such as practice guidelines and organisational policies. NOTE: This section is not intended to describe the content of such complementary requirements, but merely the subject areas and purpose.

1.4 Background reference material

This work is informed by several detailed public access documents that have been produced recently at a national level, both as precursor work to the new MBS rebates and for other strategic direction setting around telehealth in Australia. Other documents emanating from technical standards development activities undertaken, or participated in, by the Standards Australia IT-14 Health Informatics committee and its IT-14-12 Telehealth sub-committee were also considered, along with relevant Australian and International standards documents to which they referred. No review of other international documents of a similar nature was undertaken as they were deemed beyond the scope of this work.

In 2004, the International Standards Organisation published a technical report on *interoperability of telehealth systems and networks* [2]. This work indicated that while low level data coding and transmission standards were in place to support video conferencing, the disparate video conferencing standards available at the time did not assure that different systems complying with standards would be interoperable.

In September 2007, Standards Australia published a technical report providing a *survey of standards related to* telehealth [3]. This included a brief summary of the Australian and International telehealth environments, and discussed a number of examples of telehealth usage. The report defined a standards taxonomy for use in mapping existing and new standards into a common landscape based on 'tele' and 'health' dimensions, and listed standards deemed relevant to telehealth using that framework. A similar document was published in 2008 [4] on the related topic of Call Centres, and a comparable framework was defined with the dimensions of 'data' and 'systems'. Both reports provide specific recommendations on priority areas for standards development.

In September 2009, Standards Australia published a miscellaneous publication [5] providing details of data captured during some sample types of video conferencing telehealth sessions—related to the patient, practitioner and session—and suggested a need for further study of this aspect. This work was based on guidelines and operating procedures from State Health Department video conferencing services which were active on a large scale at the time.

In 2010, NICTA undertook a review of telemedicine in the context of the NBN for DBCDE [6]. This exercise studied successful telehealth initiatives elsewhere to determine success factors, and described the status of Australian telehealth activities in terms of technologies and functions. A three-tier model for barriers to uptake of telehealth was presented, and roles for NBN support of telehealth were identified.

In 2010-2011, DoHA funded an extensive project conducted through Uniquest to provide advice and options for the introduction of teleconsultation, with emphasis on establishing a business case [7]. It also studied a range of different telehealth scenarios to identify technical and operational aspects [8]. The project considered a range of issues in security/privacy/authentication, interoperability/integration, hardware/software requirements, clinical use and change management. In each of these areas, a set of recommendations was put forward. Overall it was advocated that an iterative implementation approach to national telehealth development, starting with the then-proposed new MBS rebates.

In November 2010, DoHA issued a discussion paper [9] on the topic of rebates for online consultations. The paper identified issues for consideration related to the intention of creating new MBS rebates for video consultations. This document indicated an expectation that 'many practices do or could conduct video consultations with the technology they already have' and that professional groups would need to provide advice on technical demands such as video resolution and data transmission capacities.

In June 2011, NEHTA commissioned an analysis of the current telehealth environment in Australia [10] intended to inform determination of its role in supporting the growth of telehealth. This report detailed some barriers and gaps in the Australian environment, and suggested a three-stage program for NEHTA engagement in the area, contributing respectively to interoperability, strategic planning, and governance. It articulated a set of principles which are desirable for any video conferencing solutions adopted for telehealth services.

2 Medicare telehealth services items

Telehealth is a significant part of the national eHealth agenda and there is a strong case, from both an economic and healthcare perspective, to support a national focus on the strategic rollout of telehealth services widely in Australia [11].

There have been significant investments in innovative telehealth projects in both private and public health systems in Australia since the mid-1990s. In 2001, the National Telehealth Plan [12] was released amidst a substantial body of work around the need for a coordinated approach to telehealth services delivery. Despite the development of this national framework, telehealth has continued to evolve in an ad hoc way, with some substantial developments in the hospital sectors, but very limited support for the primary care and specialist sectors.

Previously the Australian government has provided telehealth services reimbursement through MBS for only a few telepsychiatry items, in recognition of very specific needs in that area. There are now new opportunities to integrate telehealth services into the Australian health system in a more strategic way, driven by the Australian Government's investment in the NBN and the introduction of video consulting MBS rebates.

2.1 New MBS rebates

From 1 July 2011, the Medicare Benefits Scheme (MBS) was expanded to include reimbursements for telehealth services.

The government has implemented several telehealth initiatives including:

- Medicare rebates for video consultations, particularly in rural and remote areas, across a range of specialties (these do not include telephone or email consultation)
- Financial incentives for specialists, general practitioners, and other health professionals to participate in the delivery of referred specialist consultations by video consultation
- Training and supervision for health professionals using online technologies.

There are eleven new specialist telehealth items, which allow a specialist, consultant physician or psychiatrist to consult with a patient by videoconference. These telehealth items are billed with an existing specialist consultation item under the MBS, and increase the base schedule fee for the consultation item by 50%. Specialists, consultant physicians and psychiatrists will also receive a telehealth service incentive payment for each service they provide and a bulk billing incentive for each bulk billed service.

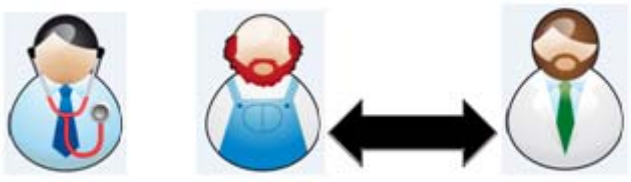
Twenty-three new patient end attendance items have also been introduced to support telehealth consultations with remote specialists. The schedule fees for these new patient end item numbers effectively represent a 35% loading on the standard consultation item fees. General practitioners, (and practice nurses and Aboriginal health workers on behalf of GPs), midwives, nurse practitioners, and other medical practitioners will be able to bill the relevant patient end attendance telehealth item in combination with both a telehealth service incentive and a bulk billing incentive.

In addition to the new item numbers and episodic consultation incentives, there is also a $6000 incentive when a health practitioner provides their first telehealth consultation or first provides support to a patient to participate in a consultation with a remote specialist. [13]

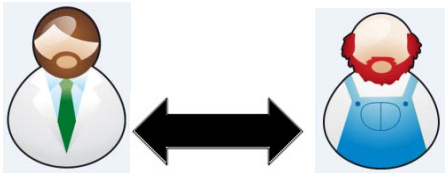
While it is not mandatory, it is intended in these new MBS rebates that the patient may have clinical support of a GP or other health professional in attendance during the consultation with the remote specialist or consultant physician. This will improve continuity of care.

The types of services covered by the new MBS items are provided by specialists; general practitioners; midwifes or aboriginal health workers.

Situation 1: GP, nurse practitioner, practice nurse, midwife or aboriginal health worker (providing clinical support to the patient) connects to the specialist or consultant.



Situation 2: Specialist connects with the patient.



2.2 Existing MBS telepsychiatry items

The new MBS items are in addition to existing telepsychiatry consultations (previous 2004 items) by a consultant physician in the practice of his or her specialty of psychiatry where the patient is referred to him or her by a medical practitioner for assessment, diagnosis and/or treatment and is located in a regional, rural or remote area.

Situation 3: Psychiatrist connects to the patient.

These items do not provide a rebate for a GP or other health professional during a remote consultation with a psychiatrist. This has been identified by the profession as one of the main reasons for the low level of usage of these items since they were introduced.

3 Technical implementation issues

Physical realisation of clinical services catered for under the new MBS Telehealth items will require some adaptation and extension of existing workplaces for the participating clinicians, quite apart from any necessary changes in workplace activities such as clinical workflow and practice. These technically-based changes can be characterised in three levels of complexity as follows:

- **Infrastructure:** telecommunications connectivity, peripheral equipment, location setup
- **Video conferencing systems:** adoption and use of suitable video conferencing products or services applied to video consultation
- **Broader operations:** information sharing; session record keeping; billing; software integration.

Each of these three areas is examined in turn to give some idea of their scope and to inform the discussion of standards which will follow. Each area contributes different aspects to the issue of interoperability which is the dominant need to be addressed by standardisation.

3.1 Infrastructure level

Implementation of the new MBS rebates depends fundamentally on the existence of ICT equipment and connectivity beyond the expected normal office infrastructure (i.e. telephone, computer, Internet). Additional infrastructure will be needed to allow the capture, presentation and transport of the elements of the video consultation sessions.

Capture requires the use of cameras, which may range from fixed configuration low end CCD accessory or inbuilt laptop/PC cameras with typical resolutions around 0.3M pixels for VGA video (e.g. Logitec Webcam C160), or more sophisticated units of over 1M pixels for HD video (e.g. Microsoft Lifecam Studio), to broadcast quality steerable zoomable cameras of 2M pixel and beyond (e.g. Sony PCSA-CXG80). Many cameras have inbuilt microphones to capture audio. Otherwise lapel, tabletop or boom/pendant units may be used.

The Uniquest report [7] recommended that cameras for non-diagnostic purposes include VGA video as a minimum.

Presentation requires a screen of suitable resolution (commonly ranging from VGA to HD), size (commonly ranging from 11-inch diagonal Netbook or Tablet to 46-inch diagonal TV) and brightness/colour properties. Alternatively, presentation could be via a more sophisticated display surface such as a smartboard, backlit screen, or data projection. Speakers or headphones will also be required for audio aspects of the presentation—often these are inbuilt to display screens.

Transport requires connection to a broadband telephony or data transmission circuit such as multiple conventional telephone lines, ISDN, ADSL, fibre or other broadband facilities. A synchronous transport protocol is preferred for continuity and reliability of service, as compared with packet-based protocols which can suffer lag or dropouts making the conferencing interactions unintelligible. Wireless based telecommunications services currently offer at best a very marginal connectivity solution as the channels are of much lower bandwidth than typical installed wire or fibre, and the modes of operation adopted by commercial service providers do not support sustained multichannel dedicated use, or consistently high Quality of Service.

Location characteristics for the appropriate use of this equipment requires the location to have suitable lighting (e.g. colour, brightness, uniformity), placement of the participants (e.g. seated/standing/lying in positions/proximities for adequate video and audio performance), decor (e.g. non distracting background, non reflecting windows), privacy (e.g. closed room with sufficient soundproofing levels), environmental controls (e.g. bright lights in eyes, disruption by air currents, discomforting temperatures, noise) and freedom from interference (electrical or radio frequency). These aspects, although technical, are very difficult to standardise because they are so closely linked with all the unconstrained aspects of the physical setting and in some cases individual preferences.

Additional specialised input or output devices may also be required for diagnostic purposes to support the type of consultation being undertaken. Common examples include augmenting the fixed camera for talking to the individual with a portable camera to inspect eyes, throat, skin, etc). In some cases additional devices to capture vital signs (e.g. digital thermometer, heart beat monitor, digital stethoscope), or probes (e.g. tactile/haptic feedback) may be required. Those devices in this category which are subject to standardisation (e.g. IEEE 11073; Continua) generally do not produce data in a form compatible with any video conferencing standard and special arrangements need to be made to allow data from them to be sent to, received by and displayed at the remote site.

3.2 Video conferencing systems level

Video conferencing systems are software or hardware-and-software systems which manage the functional aspects of video conferencing usage sessions on top of the installed ICT infrastructure level. This role includes managing users, connections, security, content and interactivity during a session. These systems can be categorised according to three different component dimensions:

A. **Implementation component:** the computer systems environment which supports the delivery of video conferencing traffic
A1. **Web-based:** downloadable software with a remote hosting environment capable of turnkey operation and automatic adjustment for use of open infrastructure (e.g. Skype)
A2. **Application-based:** requiring a vendor supplied system which must be configured for selective use of the infrastructure, but may operate over open infrastructure (e.g. Polycom)

A3. **Dedicated service:** 'hardwired' into the infrastructure and only able to operate over dedicated connections in a closed infrastructure or in-house network (e.g. Access Grid).
B **Control component:** functions that users can make use of during video conferencing for various interaction/collaboration activities
B1. **Video and audio single/multiparty:** allow person-to-person or person-to-group conversations, with speaker only (e.g. 'push-to-talk') or all parties active (e.g. chat/meeting room)
B2. **Simple meeting/collaboration tools:** basic meeting support capabilities beyond simple conversations such as screen sharing, webinar style environments
B3. **Complex meeting/collaboration tools:** more sophisticated tools for interactive information manipulation such as document access/sharing/editing, interactive pointing/drawing/selecting, recording and annotation of sessions).
C. **User access component:** nature of the relationship between user and the video conferencing system
C1. **Open access:** open freely to the public with simple automated registration process and either web-based access or downloadable software
C2. **Subscriber-based:** requires authorised membership and identification/validation of users via a secure portal, possibly with layered or role based access controls
C3. **Session-based:** joining video conferencing sessions is performed on a one-off basis, requiring individual per session access controls (e.g. meeting keys).

There are numerous examples of video conferencing solutions which embody different combinations of the above components. Compiling an exhaustive list of these would be of limited value due to the rapidity of market changes. A list of some popular products and their characteristics is given in the Uniquest report [7] p82-95. Most of these are produced by companies dedicated to this type of product (e.g. Cisco/Tandberg, Polycom,). Some other widely known solutions (typically A1-2, B1-2, C1-2 types) can be located from websites which maintain or generate product reviews or listings and some examples of these are listed below.

Web-based solutions:	**Application-based solutions:**

Confabio	Anymeeting
Dimdim	ConnectNow (Adobe)
MeBeam	GoToMeeting
Meebo	HearMe
MegaMeeting	iChat (Apple)
TokBox	InstantPresenter
Vyew	LiveMeeting (Google)
WebEx (Cisco)	Meetanywhere
ZohoMeeting	Mikogo
	ooVoo
	Redback
	SightSpeed
	Skype
	TinyChat
	Vidyo
	WengoMeeting

High-end systems offer a different range of facilities compared with the above 'consumer' mass-market oriented products. Typically they are better for multi-site situations where high fidelity (quality), high availability (capacity) and high reliability (robustness) are important characteristics of their usage. Two examples are the Cisco TelePresence environment which offers a highly optimised and instrumented video conferencing room, or the Access Grid projection-based environment which has nodes in many university and research unit locations. These systems are also suitable for specialised clinical purposes such as intensive care (e.g. VICCU, Visicu), multi-media case conferencing (e.g. Telesynergy) or telesurgery (e.g. HaiVision).

The above technical characteristics have been deployed to provide services using several different 'business models' for video conferencing to address the needs of different market sectors. These models can be categorised as:

- **Enterprise solutions** which provide business grade video conferencing using specialised and sophisticated equipment (e.g. Polycom, Tandberg)
- **Consumer centric solutions** which provide video conferencing attached to cloud offerings as a value added service and are often paired with instant messaging and mobile phone platforms (e.g. Skype, Google talk)

- **Event management solutions** which provide management platforms that allow booking of events and allow multiple parties to attend (e.g. Vidyo, Webex).

The enterprise solution providers have been the most successful in the public hospital sector, where there are sufficient inbuilt support mechanisms and dedicated networks to manage the overhead of such equipment. Without significant external support (perhaps via a managed service) it is unlikely that existing enterprise providers could scale across numerous small practices.

Alternatively, consumer centric solutions and event management solutions are less likely to need onerous support within small practices. These systems rely on significantly less expensive equipment and support contracts, and may include integrated directory and booking management infrastructure. Criticisms of all of the solutions (enterprise, consumer or event) are that they are often based or have been historically based on proprietary protocols (i.e. one product cannot connect to another and often results in the individual having to install multiple applications on their desktop). The consumer centric solutions are increasingly able to interoperate across products as a result of increased demand and competition. Some of the consumer and event management solutions have lower levels of security (which are for some products unproven) and may deliver lower Quality of Service (for both video and audio). There is a large range of products and services available, and aspects such as security, quality and interoperability can be checked with vendors in considering the various products.

3.3 Broader operations level

This level deals with the interface between video consultation activities and the overall healthcare delivery system. The broader system includes resources and activities which are mostly independent of the use of video conferencing, but nevertheless need to be accessible to users of video conferencing. There are two main areas:

Clinical information and tools: e.g. EHRs, decision support, results/reports. However this level of integration is not necessary to support the delivery of the Telehealth services covered by the new item number MBS rebates.

Administrative information and tools: e.g. ordering, billing, session recording

While many of these functions will be supported with separate elements of the current and emerging eHealth environment, in future there will be a desire for these functions to be easily integrated with video consultation sessions. For example, during the video consultation there may be a clinical need to obtain a record of some aspect of the patient's appearance (e.g. images of facial appearance or skin condition), to record output from a device (e.g. digital stethoscope), or check medication guidelines (e.g. repeat prescriptions). These tasks may be possible using existing separate systems already in a clinician's office, but in such cases manual entry or transfer of data may be necessary.

Administratively, another aspect for consideration at this level is the need for compliance with legislative (e.g. privacy, security) and clerical (e.g. billing, record keeping) needs. The video conferencing system may provide some inbuilt privacy and security features, but these may be insufficient or incompatible for the remote location, so additional mechanisms may need to be employed (e.g. additional encryption/decryption software or hardware). The automatic recording of session times and participants by the video conferencing system would assure simpler generation of billing and records information.

Rapidly evolving eHealth technologies and services will create demand, and be a catalyst, for greater integration of clinical and administrative information into telehealth consultations. In the future, this, in turn, may require the application and further development of appropriate enabling technology standards, but this is not required for the current claimable MBS Telehealth items.

4 Standards and video conferencing

The section describes the relevant **video conferencing related standards** and **health informatics related standards, and describes the work** currently **being undertaken by** various **peak health bodies to develop clinical practiced guidelines and standards.**

4.1 Video conferencing related standards

Video consultation using video conferencing, in simple terms, involves bi-directional, synchronous, real-time communication of video and audio (and possibly other data) streams between two or more parties. Video conferencing standards have their origins in videophone developments commencing in the 1970s (e.g. H.120), now superseded by more complex multimedia standards (e.g. MPEG) and more recently the explosion of Internet/web-based products/services.

Early commercial implementations of video conferencing developed in the 1980s were large and expensive multi-component systems of high complexity. These systems now face strong competition from smaller and cheaper PC/webcam based systems which are simple to install, operate and update. Today's more advanced systems provide 'collaboration' environments in which multimedia data streams are exchanged with many more options than plain video and audio, (e.g. supporting 'telepresence' or 'virtual reality' situations).

A comprehensive listing of the numerous technical standards relevant to video conferencing has been given in the Uniquest report [7] p77. A similar publicly available table (also including container standards for packaging of data into compatible formats for interoperability with other user session management and data transfer software) is included here as Appendix A. Essentially there are three broad layers in the domain of ICT technical standards that need to be considered for enabling of video conferencing:

1) Information layer: Handling of streams of information which are part of the video conferencing activity (including video, audio, data and link control components). These standards support a sequence of operations, including capture or generation of the video/audio/data streams, processing and enhancement, encoding/decoding, telecommunications transport, display presentation, error recovery. Examples of widely used standards in this space are the H.26X family for video coding, and the G.72X family for audio coding.

2) Session layer: Overall management of video conferencing sessions, with functions for session initiation/termination, connecting of video conferencing units/participants to a session, adjusting characteristics of the connection, revising screen layout, merging multiple participants and information streams, recording of the session, summarisation/annotation. Examples of widely used standards in this space are the H.32X family for video conferencing, and SIP for internet-based audio and video interactions.

3) System layer: Provision of a suitable environment within which video conferencing sessions can occur, including interoperability across different video consulting sub-systems.

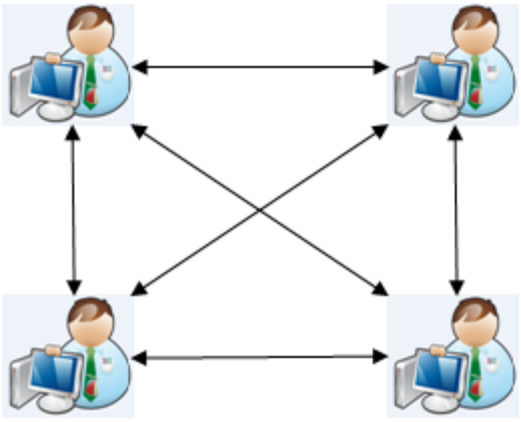
Existing approaches in the above three layers can be based on one of two different strategies:

1) Adoption of open standards: Often via open source or sometimes proprietary implementations—allowing for some degree of user or developer extensibility—and orchestration for interoperability (e.g. Openmeetings, Optiportal).

2) Development of de facto 'industry' or ad hoc standards: By specific agencies or vendors (often built around encapsulated open standards, which are not necessarily identified), which tend to be inaccessible and consequently lead to exclusive and non-interoperable products.

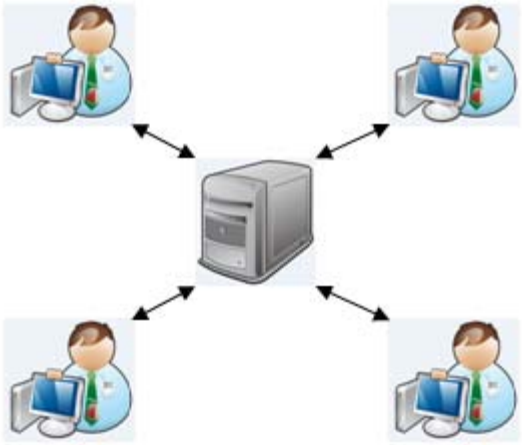
The range of video conferencing solutions which have emerged in the market have tended to be aligned with one or the other of these approaches, and this differentiation makes it difficult to bridge between the two. However in recent years, the consumer based videoconferencing products are becoming more interoperable based on increased use, demand and competition.

Direct interconnection model



In an environment where it was deemed desirable to cater for many different vendor products, multiple inter-communication protocols would be needed (possibly one unique protocol per vendor product). This would result in the configuration shown on the left.

Indirect interconnection model



The alternative approach is to provide some intermediate processing component in the system, which would allow translation of the different protocols to achieve interoperability. This would result in the configuration shown on the left.

Currently it would be challenging to build an environment which accepts feeds from several different video conferencing systems and transforms them in such a way as to be able to deliver them to all of the other systems. Such a development would challenge existing market competition models, which are delineated by proprietary features and protocols.

4.2 Health informatics related standards

Technical standards related to software and ICT equipment development and usage generally also apply in health applications, sometimes with greater demands placed on them for certain aspects (e.g. compliance and failure mode behaviour). Some standards of this type have been expressly extended or developed by Standards Development Organisations (SDOs) for Health ICT as the target usage area (e.g. through ISO TC-215 and CEN TC-251). In Australia, the Standards Australia IT-14 Committee undertakes work related to this area.

Other generic ICT standards that are embraced widely already in the business/industry sector (e.g. IEC, ITU, IEEE) may also be relevant in this area (e.g. data compression, security encryption). Many of these will affect the way in which video conferencing for health might take place. In addition, the future widespread use of all forms of video consultation may require some existing mainstream health informatics standards to be modified and extended.

The areas of Health Informatics technical standardisation addressed by ISO TC-215 are:

- Data structure
- Data interchange
- Semantic content
- Security
- Pharmacy and medicines business
- Devices
- Business requirements for electronic health records
- SDO Harmonisation.

The areas of Health Informatics technical standardisation addressed by CEN TC-251 are:

- Security, safety and quality
- Technology for interoperability
- Information models
- Terminology and knowledge representation.

The areas of Health Informatics technical standardisation addressed by SA IT-14 are:

- eHealth concept representation
- Information security
- Messaging and communication
- Patient administration messaging
- Prescription messaging
-

- Electronic health records interoperability
- Supply chain
- Telehealth.

Areas of health informatics standardisation covered by other SDOs are more specific: these include health data structuring and messaging (HL7), coding and terminologies (IHTSDO and WHO), health research data formats (CDISC), image formats (DICOM), numbering systems (GS1). Efforts are being made to harmonise both standards and workplans between these organisations.

Any of the above areas for technical standardisation could potentially impact on telehealth, in that it is an ICT-enabled activity. However, there are some areas that deserve particular attention as they are more strongly associated with other core operational aspects in the health environment. In this paper ISO standards have been taken as the reference domain in this discussion because the Standards Australia national affiliation is with the ISO. Some issues arising for these areas are listed below.

Data and messaging standards:

- Coding and terminology standards may need to make provision for video conferencing situations (e.g. describing the type of consultation, or clinician rating of Quality of Service).

Privacy and security:

- Additional opportunities exist for privacy and security breaches during capture, transmission and storage of video conference consultations and may need to be addressed (e.g. eavesdropping on sessions, recognising patient from face/voice).
- Existing standards in this area will need to be interpreted expressly for video conferencing situations (e.g. ISO 27799:2008 Health informatics — Information security management in health using ISO/IEC 27002; ISO/TR 11633-1:2009 Health informatics — Information security management for remote maintenance of medical devices and medical information systems — Part 1: Requirements and risk analysis; ISO/TR 11633-2:2009 Health informatics — Information security management for remote maintenance of medical devices and medical information systems — Part 2: Implementation of an information security management system (ISMS)).

Medical device standards:

- Compliance with normal equipment standards issues for health applications of computing devices would be expected such as EMC (e.g. ISO/TR 21730:2007 Health informatics — Use of mobile wireless communication and computing technology in healthcare facilities — Recommendations for electromagnetic compatibility (management of unintentional electromagnetic interference) with medical devices).

Telehealth standards:

- The progression of ISO DTS 13131 Health Informatics - Quality criteria for services and systems for telemedicine, should be monitored as this will provide some elements of bridging between technical standards and clinical standards. It may be desirable to encourage adoption of principles from this document within some of the clinical standards currently being developed, as discussed below.

4.3 Clinical practice guidelines and standards

Video conferencing is a service delivery activity used in a clinical situation and therefore requires appropriate clinical practices to be employed for its use. Quality of service for teleconsultation can translate into a major clinical safety issue. Peak medical bodies both in Australia and overseas have produced clinical guidelines on telehealth to assist doctors in exercising their professional clinical judgement about whether a particular consultation with a particular patient can be safely and effectively delivered by video conference.

These guidelines are expected to describe the operational issues required to support best practice use of telehealth video conferencing. In time, these clinical guidelines may be expanded to address different issues for other types of consultation such as multidisciplinary case conferences or for other media such as SMS, email or telephone.

The Medical Board of Australia has released a draft Telehealth Standards paper that sets out the Board's expectations of all registered medical practitioners with regard to technology based patient consultations. Following public consultation the Board will finalise the guidelines, taking into account feedback gathered through the consultation process.

The Australian Medical Association (AMA) in its Position Statement: Online and Other Broadband Connected Medical Consultations published in 2006 released a set of principles to guide the provision of such consultation systems.

The Royal Australian and New Zealand College of Psychiatrists in its amended Position Statement # 44 published in February 2009 has detailed examples of telepsychiatry services and quality practice guidelines to support the delivery of these services. These guidelines include area such as patient identification, communication with the patient, evaluation of information relevant to the consultations, and appropriate records management.

The Royal Australian College of General Practitioners (RACGP) has published a paper for clinical standards or guidelines for general practices to support the safe usage of telehealth video conferencing. These guidelines are comprehensive and highlight a range of safety and quality issues of particular significance to general practices offering video consultations with medical specialists. Other topics covered in detail are: patient identification, clinical handover, consultation notes, presence of a third party, clinical governance, privacy, security, practice facilities and equipment.

The Australian College of Rural and Remote Medicine (ACRRM) is developing a telehealth standards framework for clinicians. Although not available for reference at this time, the ACRRM Telehealth standards framework will be underpinned by, and referenced to the final version of the Medical Board of Australia's Telehealth Standards.

It is inevitable that more guidelines for the safe use of video conferencing for telehealth consultations will be developed by local peak bodies that will be informed by the excellent work done by overseas organisations such as those published by the **American Telemedicine Association (ATA)** which are now considered to be mature.

5 Commentary

Considering the matters covered in the previous sections of this document, several categories of limitations can be identified, in the form of unresolved issues and unmet needs. This section articulates these limitations and in some cases discusses potential resolutions. As described on page 21, the work being done by organisations such as the RACGP and ACRRM is designed to resolve some of these issues.

The domain of interest here remains technical implementation and technical standards issues. While those may inform the choice of technical alternatives, they should also be tolerant of a choice of different technical options for different situations.

5.1 Infrastructure issues

Selection of peripheral equipment and physical location layout characteristics for video conferencing is neither standardised nor readily standardisable by technical fiat: this is more the domain of best practice guidelines. Equipment characteristics (such as resolutions) capable of delivering acceptable/fit for purpose clinical performance have been established by experience and experiment, but not rigorous evidence-based methods, so these can at best be determined by describing 'typical' or 'minimum' choices. It would not be productive to drive telehealth consultations down the same path as radiology where high grade equipment and repeated calibrations are essential to operational procedures. Rather, a 'fit-for-purpose' professional judgement may need to be exercised by the user, and acceptance/responsibility for clinical decisions made contingent on that.

Until the NBN roll-out is substantially underway, the existing telecommunications connection and transmission environment is a major source of limitation for video conferencing. Quality of Service aspects such as speed, latency, availability, reliability, and robustness are difficult to guarantee other than on an averaged percentage basis on existing infrastructure, even with high grade or high bandwidth solutions. An added factor is the need to tolerate asymmetric situations, where high bandwidth channels may be available for most of the connection but the final 'last mile' connection to an endpoint may be restricted in capacity. This situation may occur when there is a need for flexibility at one of the endpoints (e.g. if a wireless connected tablet is substituted for wired connection PC). This will remain as a limitation until Australia is able to fully leverage the NBN infrastructure. Not withstanding the current technology limitations, it is possible to deliver fit for purpose telehealth consultations in line with the current policy intent which is aimed primarily at consultations between a patient and GP at one end and a specialist at the other. This approach maximises the appropriate telehealth adoption today and reduces the risks associated with the current infrastructure limitations of video conferencing.

5.2 Video conferencing issues

The plethora of available video conferencing solutions with differing performance characteristics and functionality, and varying degrees of standards compliance, tends to confound the choice of a 'best' or even 'top few' systems. The existing range of videoconferencing services includes both high-end proprietary systems, which would have the advantage of connecting with corresponding systems in public sector health enterprises (e.g. state or hospital systems), and low complexity simple web-based systems, which are more affordable and still able to provide a fit for purpose consultation. There remains an issue that users may need to have more than one system available for dealing with a wider range of endpoints, following the 'Direct Interconnection' model. The cost of these services is however not prohibitive, and remain a viable alternative for short term delivery of valuable and beneficial telehealth services.

While well established International standards exist for information communication and session control in video conferencing systems, they contain sufficient optional and framework aspects which can be implemented in different ways by different manufacturers and yet still achieve compliance. The end result is a lack of interoperability between different vendor solutions. (The situation is similar to that of medical image storage formats, where DICOM is a widely used standard for medical image representation but different vendors of DICOM compliant products have implemented the standard in sufficiently different ways as to make their data files not fully portable). There are two different operating models that would most easily support videoconferencing interoperability. However, in the absence of both of these suggested operating models, any provider-to-provider interoperability requirements should be discussed between those providers.

1) **Model 1:** Vendors agree on some form of minimum common implementation of standards and provide that option bundled in with their full proprietary systems. This enables a widespread 'Direct Interconnection' model of operations which could operate uniformly nationally.

2) **Model 2:** An independent third-party type service is provided which accepts a video conferencing stream in any vendor format and reframes it for output in a different vendor format (analogous to telephone conferencing services). This enables an 'Indirect Interconnection' model of operations which could operate either regionally or nationally.

Model 1 requires vendor cooperation and investment, and may result in a system limited in functionality as a 'lowest common denominator' approach is likely to be taken. **Model 2** offers a quicker and easier solution to implement (as there would be no requirement for vendors to change their products) but it is likely to be a far more costly option than model 1, whether publicly funded or commercially operated, due to ongoing maintenance and technical support needs.

If the 'Direct Interconnection' model is ultimately adopted, an additional complication is the need for users to be able to locate other users with compatible systems (or endpoints). A national 'subscriber' directory service could resolve this issue, with an enforced protocol for updating so that it was never out of date. Provision of a 'ping' facility would be advisable so that it was possible to validate the currency of entries automatically. Even for the 'Indirect Interconnection' model, directory information will be needed to locate clinicians who are willing to undertake teleconsultation: however this could possibly be achieved by setting flags in the national provider directory associated with provider identifiers. This begs a question of whether system-wide

scheduling capabilities for video conferencing sessions would also be desirable, to avoid the difficulty of person-to-person negotiations for common calendar space.

5.3 Broader operations issues

A broader issue is the need to adhere to legislative and best practice requirements for privacy, and security. While there are analogies to telephone and email use, video conferencing is often regarded as more vulnerable because of the immediate human capacity to interpret speech and picture. Some threats to be addressed include eavesdropping on sessions, interception of transmissions, and visibility of any recorded parts of sessions. Encryption of transmissions within a video conferencing system is inevitably a proprietary implementation which the vendor or operator is unlikely to be willing to disclose. Therefore, it may be more workable and efficient to apply a separate encrypt/decrypt layer as a 'wrapper' or 'transformation' to the raw transmission data, using well established methods like public/private key cryptography.

5.4 Future operational issues

While the use of video conferencing technologies can be used in telehealth applications, there may be future work to integrate the video capabilities with other clinical software systems and services.

Intersections between video conferencing systems and clinical information systems capabilities need further consideration. The ability to log details of video conferencing sessions automatically into patient administration records, and clinical observations into electronic health records, may require some extensions to data structure and terminology standards, and messaging. This enhancement may also offer solutions to video conferencing session audit and validation needs, such as correct identification of the participants. Integration of access to clinical information systems for retrieval, sharing and modification of patient data during a videoconferencing session may also be beneficial, especially if it allows the same information to be contributed to records kept by each of the participating clinicians. Needs for intersection with information managed by specific services such as a national authentication service for health (NASH) and Medicare Australia may also be resolved by this form of integration.

6 Conclusion

This document describes the technical standards required to support the telehealth services eligible for the new MBS items that became available on 1 July 2011, and the existing 2004 MBS items for telepsychiatry services. Section two provided an overview of these MBS items and illustrated the types of services covered. Section three surveyed the range of factors that influence how those services will be delivered at an infrastructure level, video conferencing level and broader operations level.

Section four set out relevant video conferencing related standards and health informatics related standards, and described the work currently being undertaken by various peak health bodies to develop clinical standards. Section five identified limitations in standards and discussed methods of realisation with remarks and some open questions that will need further consultation to resolve.

In conclusion, the matters considered in this document suggest that generally the technical standards space caters well for video conferencing, and that the current technological environment is sufficiently standardised to support delivery of telehealth services under the new (current as at 1 July 2011) MBS rebates.

The issue of interoperability between video conferencing products implemented by different vendors persists as an impediment to free ranging video conferencing between arbitrary systems, despite the existence of these relevant technical standards. There is a need for development of complementary clinical standards defining protocols and processes to support clinicians to deliver telehealth services. These are expected to improve over time based on improved technologies, increasing use, demand and competition.

Appendix A

v • d • e	Multimedia compression and container formats	
Video	ISO/IEC	MJPEG • Motion JPEG 2000 • MPEG-1 • MPEG-2 (Part 2) • MPEG-4 (Part 2/ASP • Part 10/AVC) • HEVC
	ITU-T	H.120 • H.261 • H.262 • H.263 • H.264 • HEVC
	Others	AVS • Bink • CineForm • Cinepak • Dirac • DV • Indeo • Microsoft Video 1 • OMS Video • Pixlet • RealVideo • RTVideo • SheerVideo • Smacker • Sorenson Video, Spark • Theora • VC-1 • VC-2 • VC-3 • VP3 • VP6 • VP7 • VP8 • WMV
Audio	ISO/IEC	MPEG-1 Layer III (MP3) • MPEG-1 Layer II (Multichannel) • MPEG-1 Layer I • AAC • HE-AAC • MPEG Surround • MPEG-4 ALS • MPEG-4 SLS • MPEG-4 DST • MPEG-4 HVXC • MPEG-4 CELP
	ITU-T	G.711 • G.718 • G.719 • G.722 • G.722.1 • G.722.2 • G.723 • G.723.1 • G.726 • G.728 • G.729 • G.729.1
	Others	AC-3 • AMR • AMR-WB • AMR-WB+ • Apple Lossless • Asao • ATRAC • CELT • DRA • DTS • EVRC • EVRC-B • FLAC • GSM-HR • GSM-FR • GSM-EFR • iLBC • iSAC • Monkey's Audio • TTA (True Audio) • MT9 • A-law • μ-law • Musepack • OptimFROG • Opus OSQ • QCELP • RealAudio • RTAudio • SD2 • SHN • SILK • Siren • SMV • Speex • SVOPC • TwinVQ • VMR-WB • Vorbis • WavPack • WMA
Image	ISO/IEC/ITU-T	JPEG • JPEG 2000 • JPEG XR • lossless JPEG • JBIG • JBIG2 • PNG • TIFF/EP • TIFF/IT
	Others	APNG • BMP • DjVu • EXR • GIF • ICER • ILBM • MNG • PCX • PGF • TGA • QTVR • TIFF • WBMP • WebP
Containers	ISO/IEC	MPEG-PS • MPEG-TS • ISO base media file format • MPEG-4 Part 14 • Motion JPEG 2000 • MPEG-21 Part 9
	ITU-T	H.222.0 • T.802
	Others	3GP and 3G2 • AMV • ASF • AIFF • AVI • AU • Bink • DivX Media Format • DPX • EVO • Flash Video • GXF • M2TS • Matroska • MXF • Ogg • QuickTime File Format • RealMedia • REDCODE RAW • RIFF • Smacker • MOD and TOD • VOB • WAV • WebM

References

1. Australian Government (2011). Health Insurance (Telehealth Services) Determination 2011 of the Health Insurance Act 1973, Federal Register of Legislative Instruments F2011L00954, 23 May 2011.
2. International Standards Organisation, Interoperability of Teleheath Systems and Networks (2004). http://www.americantelemed.org/files/public/membergroups/technology/Technology_HealthInformatics1.pdf
3. Standards Australia, (2007). Technical Report TR 2961-2007. Telehealth standards scoping study. Retrieved from http://infostore.saiglobal.com/store/ViewDocument.aspx?saleitemID=733063&freeDownload=1
4. Standards Australia (2008). Technical Report TR 4887-2008. Call centre standards scoping study. Retrieved from http://infostore.saiglobal.com/store/...
5. Standards Australia (2009). Miscellaneous Publication MP 99-2009. Telehealth Session information required for health records. Retrieved from http://infostore.saiglobal.com/store/...
6. NICTA (2010). Telemedicine in the context of the National Broadband Network. Retrieved from http://www.nicta.com.au/research/rps?sq_content_src=%2BdXJsPWh0dHBzJTNBJTJGJTJGcHVibGljYXRpb25zLmluc2lkZS5uaWN0YS5jb20uYXUlMkZzZWFyY2glMkZzaG93JTNGaWQlM0Q0NDIxJmFsbD0x
7. Uniquest (2011). Telehealth Assessment Final Report. Retrieved from http://www.mbsonline.gov.au/internet/mbsonline/publishing.nsf/Content/EC471B2E09EE7370CA2578A4001092BE/$File/UniQuest%20Telehealth%20Assessment%20Report%20.pdf
8. UniQuest Pty Limited, (2011). Prepared for the Department of Health and Ageing. Telehealth Business Case, Advice and Options Final Report. Retrieved from http://www.mbsonline.gov.au/internet/mbsonline/publishing.nsf/Content/EC471B2E09EE7370CA2578A4001092BE/$File/UniQuest%20Telehealth%20Business%20Case%20Advice%20and%20Options.pdf
9. Australian Government, Department of Health and Ageing (2010). Connecting health services with the future: Modernising Medicare by providing rebates for online consultations. Retrieved from http://www.mbsonline.gov.au/internet/mbsonline/publishing.nsf/Content/256BA3C38B7EEA22CA2577EA006F7C42/$File/Telehealth%20discussion%20paper.pdf
10. National E-Health Transition Authority, (2011). NEHTA Telehealth Report. Retrieved from http://www.nehta.gov.au/ TBA
11. Department of Broadband Communication and Digital Economy. NBN. Empowering Australia. Canberra: Australian Government; 2011 [cited 2011 1st June]. Retrieved from www.nbn.gov.au/health-and-aged-care-2/government-initiatives/medicare-benefits-schedule-expansion
12. National Health Information Advisory Council, (2001). National Telehealth Plan for Australia and New Zealand. Retrieved from www.health.gov.au/internet/hconnect/publishing.nsf/content/.../teleplan.pdf

13. The Hon Nicole Roxon MP. Media release. Telehealth fees unveiled. 6 June 20112011: Retrieved from http://www.yourhealth.gov.au/internet/ministers/publishing.nsf/Content/mr-yr11-nr-nr116.htm?OpenDocument&yr=2011&mth=06