THE MEDICAL SOFTWARE INDUSTRY ASSOCIATION (INC)

Clinical Messaging Profile

Version History

Version	Date	Author	Comment
0.1	3-Dec	Grahame Grieve	First Draft

TODO LIST

1) Todo: ***Include "Receiver Responsibilities" from the existing IHE diagnostic and Referral profiles***

Introduction

Background process, etc

Scope

This profile constrains clinical messages exchanged between diagnostic and clinical systems containing diagnostic reports or referrals in Australia by making rules with respect to the content of the message, the behaviour of the sender system, and the behaviour of the receiving system. The profile is expected to be used where the two parties - sender and receiver - have no particular trading partner agreement covering the exchange of the messages. This profile is not intended for use within single institutions such as a hospital, or even within jurisdictional systems, though such applications are welcome to adopt part or all of this specification where it serves their purpose.

This specification is wholly concerned with the content that is exchanged, and makes no rules concerning how messages are transported between entities, or any specific rules about how addressing is resolved. Note though, that some of the rules in this specification are defined to enable correct addressing to occur. However the details of how the addressing is actually made to work are outside the scope of this profile.

Conformance Roles

This profile defines two roles to which conformance applies: Sender and Receiver. When applications make conformance claims, they must do so against either one or both of these roles. Purchasers of conformant systems must specify which of the roles they require conformance to.

Sender

This role applies to applications that send diagnostic or clinical messages, and would include pathology and radiology information systems, and clinical desktop systems that send referrals. For sending systems, the conformance rules to which they must conform are divided into two parts:

Name	Function
"message"	These rules express requirements that can be tested by examination of the message that is produced.
"sender"	These rules express requirements that can only be tested by human interaction with the software

Receiver

This roles applies to an application that receives and processes diagnostic or clinical messages. Typically, these are clinical desktop systems used by GPs and specialists. For receiving systems, there is only one set of rules:

Name	Function
"receiver"	These rules express requirements that can be tested by examination of the message that is produced.

Intermediaries

This role applies to intermediaries that process the message as it travels from sender to receiver system.
Todo: what rules?

In addition to declaring conformance against these roles, receiving applications may also declare themselves capable of supporting the following optional features:

- UTF-8
- Support for multi-page TIFF images

Capabilities Register

Todo

1. Image formats supported in OBX segments (one or more of JPG, PNG, multipage-TIFF)
2. Support for Datatype RP (reference pointer) in OBX segments for web references
3. Support for display segment formats (one or more of PIT, RTF, PDF, XHTML)
4. Support for character set UTF-8
5. Datatype TX permitted
6. Conformance profile(s) supported
7. HL7 V2 Digital signatures support level (1 = aware, 2 = checked)
8. Dataype FT supports imbedded web references www…
9. Extended RTF support: (i) Columns, (ii) Header/footer cross references (iii) Fields (iv) Word forms (v) Watermark
10. Extended XHTML support: (i) Image maps
11. Extended PDF support: (i) Embedded fonts (ii) Digital signatures

Notes:

(a) Support for PIT display segments is assumed if no specific display formats are listed
(b) Support for character set 8859/1 is mandatory and assumed.

Message Handling

Sender-1: All messages sent SHOULD be archived in a tamper-proof form and available to assist with troubleshooting

Receiver-1: All messages received SHOULD be archived in a tamper-proof form and available to assist with troubleshooting

The message record represents an important source of clinical communications, and integrity must be maintained, including proof against deliberate tampering

message-1: The total message size SHALL NOT exceed 16MB

receiver-2: Receivers SHALL be able to accept messages up to 16MB in size

Segments may be any size, so long as the total message size is not exceeded. For attachments – particularly images – that would cause the message to exceed this size, use the RP data type to send a web reference. Use of RP is encouraged for low-bandwidth users.

Receiver-3: Receivers SHALL be able to accept messages that are not in batches

Message-2: If used, batches SHALL specify individual message acknowledgement

Receiver-4: Receivers SHALL not use any information out of the batch headers and footers

The only purpose of a using file and batch segments is to ensure that the batch or file has not been truncated.

receiver-5: Receivers SHALL recognise OBX segments that carry digital signatures

receiver-6: Receivers SHOULD check the digital signature

If an application finds a digital signature OBX segment they should at least ignore it or display "Digitally signed". Applications should adopt the digital signature standard when published by Standards Australia and accepted by Medicare.

Syntax And Encoding

message-3: The field delimiter SHALL be "|"

message-4: The contents of the MSH-2 field SHALL be "^~\&"

message-5: All message content SHALL have the characters |^~\& properly escaped

receiver-7: All fields SHALL be unescaped properly

There has been a lack of clarity in the HL7 standard concerning whether all fields are escaped, or just some, and this, along with general carelessness, has manifested in many operational problems with unescaping messages in practice. All implementations are required to perform escaping and unescaping correctly on all fields. Changing the escape characters to avoid the need for escaping is not an acceptable approach, and causes needless complexity.

message-6: Only fields of type FT may contain line breaks as part of the message content.

There is no escape character for the segment delimiter '<CR>'. The only usable escape sequence is \.br\ in the FT type, and so this is the only field type that may contain line breaks. Complex document content carried in ED may also carry line breaks – see notes below.

message-7: The MSH segment SHALL only contain ASCII characters

message-8: The character set in use in the message SHALL be specified in MSH-18

message-9: The character set used in the message SHALL be "8859/1" or "UTF-8"

receiver-8: Receiving systems SHALL support the character set "8859\1"

sender-2: Sender systems SHALL only use the character set "UTF-8" when support for this character set is registered in the destination capabilities register

message-10: The escape sequences \C and \M SHALL NOT be used

message-11: Characters below space (&20) SHALL NOT be used in message content

Character set 8859/1 is also known as "extended ascii", and has useful characters in the 128-255 range for medical reports. UTF-8 support is optional but encouraged. The character &13 is used as a segment delimiter, so does not count as part of the message content.

message-12: fields of type ED SHOULD be base64 encoded

message-13: when a field of type ED is base64 encoded component 3 SHALL be "base64"

receiver-9: Receiving systems SHALL be able to decode base64 ED fields

Base64 is frequently not performed properly, o, on the receiver side, frequently not processed correctly. Base64 encoding must be correct per 4700.2-2007 Appendix A. If the ED is not base64 encoded, it must be escaped correctly.

Message Identification

message-14: MSH-21 SHALL contain "msia-0.1"

This identifies that the message is conformant to this specification. This value can only be used in production systems where the system has met the rules described above for claiming conformance to this profile. Note that 0.1 is the current version of this specification (from the version table at the head of the document).

sender-3: Every message SHALL have a unique identifier in MSH-10

In some implementations duplicate MSH message IDs (MSH-10) are used for the same report to multiple "copy to" doctors. This is contrary to the standard which specifies that every message must have a unique ID and breaks the acknowledgement mechanism. The message ID must be unique within the scope of the sending facility. A possible mechanism for generating a unique message ID is a date/time stamp plus counter or other unique facility ID. The MSH-10 field length (20) does not support a GUID.

sender-4: Every report SHALL have a unique identifier in OBR-24

Reports are identified by the OBR Filler order number in both REF and ORU messages and therefore the Filler order number entity Identifier must be unique within the scope of the Filler HD. Many identifiers are not scoped by the Filler HD and use very simple values eg "123" which makes uniquely identifying documents impossible. This causes duplicate results/documents and creates the potential to ignore documents that are thought to be the same as an existing document but in fact are from different organisations. Note that the Filler order number in the OBR/ORC segments must be unique in the order e.g. order number-FBC

sender-5: When resending a message, the sender field (MSH-4) SHALL be changed

receiver-10: OBR-3-2 SHALL be used to identify the author.

Laboratory results when forwarded to GPs via a specialist should display the laboratory that performed the result and the specialist who forwarded it. The MSH sender field should be updated to be the specialist, not left as the laboratory where the data originated. The laboratory that performed the result is recorded in the OBR data segment. The message ID of the forwarded message needs to be different from the message originally received by the specialist

sender-6: MSH-6 SHALL be used to identify destination organisation.

sender-7: For non-REF messages, PV1-9 SHALL be used to identify the specific health practitioner to whom the message is addressed.

sender-8: For REF messages, a PRD segment with provider type "IR" SHALL be used to identify the specific health practitioner to whom the message is addressed, and the information duplicated in PV1-9

The messaging facilities in MSH are concerned with the question of addressing messages to organisations. The additional facilities added to MSH in later versions still do not address how to deliver a message to an individual. For the REF message, duplicating the destination practitioner helps for compatibility and where the REF messages are used to construct other messages types.

sender-9: OBR-24 SHALL be populated correctly with values from AS 4700.2 for Diagnostic Messages, or from the HL7 standard for Referral messages

sender-10: The message type (MSH-9) SHALL match the trigger event

receiver-11: Receiver systems SHALL be able to process messages that include multiple documents, and correctly track the type and author of the documents.

Trigger events matter – an ORU message is triggered by an Unsolicited observation, whilst a REF message is triggered by a transfer of care, and systems should not use these inappropriately.

REF and ORU messages can both contain multiple "documents" (OBRs) and can both contain diagnostic results. OBR-24 (diagnostic service sector ID) must be populated in order to allow correct document indexing/categorisation, and must be processed correctly. Note that ORU messages compliant with the Australian Standard are restricted to values in OBR-24 for diagnostics, and for REF messages, the values of OBR-24 should be taken from the international standard.

Where systems have separate document stores for diagnostics (pathology and radiology) and referral information, the value in OBR-24 should be used to determine in which storage area to place the data. OBR-24 values specified in 4700.2 should cause the information to be stored in the diagnostics area.

Patient and Provider Identification

message-15: All identifiers SHOULD have an assigning authority

message-16: All identifiers SHOULD have an identifier type taken from the HL7 table 203 for version 2.4

message-17: All identifiers SHALL have at least one field of assigning authority and identifier type

Identifiers that have no assigning authority or type are useless. An identifier type helps, but except for a few very specific identifier types still do not clarify the identifier. Making up identifier types doesn't help understand identifiers.

message-18: IHIs SHALL be rendered with an assigning authority of "AUSHIC" and an identifier type of "NI"

message-19: HPI-Is SHALL be rendered with an assigning authority of "AUSHIC" and an identifier type of "NPI"

message-20: HPI-Os SHALL be rendered with an assigning authority of "AUSHIC" and an identifier type of "NOI"

Examples:

- IHI, PID-3: |8003601234512345^^^AUSHIC^NI|
- HPI-I, PRD-7: |8003610537409456^NPI^AUSHIC|
- HPI-I, XCN: |8003610537409456^[surname]^[given]^[etc]^^[title]^^^AUSHIC^^^^NPI|
- HPI-O, XON: |[name]^L^8003621771167888^^^AUSHIC^NOI|

receiver-12: Receiving systems SHALL recognise any DVA number, Medicare number and the IHI number in incoming messages

receiver-13: Receiving systems SHALL display any DVA number and Medicare number when displaying the message contents

IHIs are exempt from this requirement due to sensitivities caused by the law regarding imparting IHI numbers.

Data Type Specific Issues

message-21: The TX data type SHALL NOT be used

The FT data type provides all capabilities of the TX datatype.

TODO: notes from interoperability working party said both this and "Datatype TX may only be used by agreement with receiver"

receiver-14: The receiver SHOULD be able to display segments with an RP data type as a web reference

todo: ed media types

receiver-15: The receiver SHALL be able to display segments with an RP data type as a web reference

sender-11: Sending systems SHOULD ensure that any RP data type web references are accessible to the destination users, and remain viable for a clinically relevant period of time

In addition, receiving applications may also scan text content for content that looks like URLs, and turn these into web references, but are not required to do so.
Todo: dtailed notes anbout rp for URLS

Note: SHOULD not SHALL in earlier version

Examples of HD and how they should be displayed in version 2.3.1 and 2.4, especially where there are GUIDs, are needed

OBR/OBX

Sender-12: When a report is amended, all OBX segments associated with the report SHALL be resent. Any OBXs that have changed SHALL be marked as amended, and other OBX segments may be marked as unchanged

It's never possible to be sure that a specific message recipient has a copy of the previous report, so it's not safe to only send the amended OBXs; instead, the entire report – atomic OBX segments, if any, and any display segments – must be resent each time any part of the report changes.

Receiver-16: When an amended report is received, the data from the amended report SHALL supercede all the data from a previous copies of the report

This is of critical importance, especially with diagnostic reports. Though the amended report supercedes the previous report, the previous copies should be available with users clearly warned that the contents have been superceded.

Sender-13: OBR-20 SHOULD contain CP=Y when a message is a copy message

Message-22: For diagnostic messages, the ordering/requesting doctor SHOULD be placed in OBR-16

Sender-14: Multi-line text fields SHALL be sent as a single FT field, not as multiple OBX segments

Receiver-17: For diagnostic messages, the principal result interpreter SHALL be displayed with the report

The principal result interpreter is found in OBR-32. The given name and the family name are required. Additional (sub) components such as prefix and ID are optional.

Receiver-18: OBX-3 SHALL not be displayed where OBX-2 has a value of "FT"

If OBX-3 is to be displayed then use ST in OBX-2.

Receiver-19: If OBX-2 has an unknown datatype, the receiver SHALL alert the user to the unknown data

Receiver-20: If OBX-2 has type ED, and the ED mime type is unknown, the receiver SHALL alert the user to the unknown data

Unknown/unsupported data should not simply disappear. The user should be warned that some data has not been understood.

If the ED mime-type is unknown, the application should show "digital data of unknown format [type/subtype]" and may offer the user and opportunity to let the operating system display the content.

message-23: Multiple display segments MAY be included

The concept of a display segment is defined in the AS 4700.x standards. This rules is a variance to older versions of the AS 4700.x standards, which only specified one display segments. New versions of the AS 4700. x standards will allow for multiple display segments.

sender-15: The contents of all the display segments SHALL be semantically equivalent.

receiver-21: The sender SHOULD choose the display segment that displays best on the target platform

receiver-22: If the receiver doesn't support any of the formats natively, they SHALL provide for the content to be viewed externally by another application

The sender can only send formats where it can be confident they are semantically equivalent. The correct encoding for OBX fields 1-4 in the display segments is one of the following:

OBX||FT|PIT^Display format in PIT^AUSPDI||…
OBX||ED|RTF^Display format in RTF^AUSPDI||…
OBX||ED|PDF^Display format in PDF^AUSPDI||…
OBX||ED|HTML^Display format in HTML^AUSPDI||…

The datatype for a PIT display segment is FT and ED for the others. The use of Datatype ED for an HTML format display segment is a variance to the AS4700.2 standard but is necessary to deal with extended characters. AS 4700.2 will be updated.

Display formats

There is no single format for either documents or images that is fully supported and seamlessly interoperable across all platforms. These formats are defined for a wider set of use cases than that used here, and contain features that are not appropriate for use in clinical messages. In addition, the formats support display features that are not uniformly supported in clinical software, and therefore cannot be safely used. (in some targets, misunderstood or partially supported features (e.g. missing fonts) can result in lost text).

The rules that this profile makes about the use of these formats are intended to make sure that documents can be exchanged with the least risk across all the platforms in use throughout Australia. Rather than writing formal conformance statements, as is done throughout this document, this section uses a tabular form that describes the features of the respective formats that either must be supported by receivers (and therefore can be used by senders safely) or features that must not be sent by senders (and therefore do not need to be implemented by receivers).

Some features are specified as optional; this means that senders should ensure that any content using these features is not critical to interpreting the document correctly (i.e. they should be used with great care, and generally only for branding/corporate content, not clinical content). Where an Endpoint Capability Register (see section 1) is available and there is an entry for the intended receiver endpoint (see Appendix C), optional elements should only be included by senders if they are marked as supported in the endpoint capability register.

Images

receiver-23: Receiving systems SHALL be capable of displaying JPEG and PNG images

sender-16: Sender systems SHALL only include multipage TIFF files if the intended recipient declares support for this

Senders can be confident that JPEG and PNG images will be displayed correctly. Multi-page TIFF images are often used for including faxes. Many image libraries will only display the first page, and there is a risk that clinical content will be lost, so these may only be used where this is known to be safe.

FT

FT is documented here as a "display format", but this profile says that it is not to be used in display segments (it may be used in other segments). However many existing systems do send the display segment using FT. This rules apply for all uses of the FT data type.

receiver-24: The FT data type SHALL NOT displayed using a non-proportionally spaced font

This is so that tables laid out using text – of which there is a vast amount in legacy data - display properly

receiver-25: Receiving systems SHOULD scan the FT for URLs and present this as actionable hyperlinks

This can be done with various pattern matching approaches such as Regex, and is a convenience for the user.

Sender-17: Do not use ^ or & (component or repeat delimiters) to break an FT across lines or paragraphs – using the \.br\ escape instead

Format Rules

Strictly, FT is described in terms of cursor operations on a character console. This documentation describes the data type in terms of text formatting. Note that Word wrap is on at the start of every FT

Feature	Description
Must Support:	
\.br	Start new line. Technically, according to HL7 "Set the horizontal position to the current left margin and increment the vertical position by 1". In practice, this means and end if line character (#0D or #0D#0A depending on the platform). If the FT is converted to RTF, a \par. If it is converted to HTML, a <p> etc
\.fi	Turns word wrapping on. ("Fill mode")
\.nf	Turns word wrapping off (i.e. the content that follows is laid out as a table). ("Nofill

	mode")
\.in[N]	Indent the paragraph that follows by N spaces. (or, by N times the width of an average character). This command must appear first before any other content in a paragraph
\.ti[N]	Indent the first line of the paragraph that follows by N spaces. (or, by N times the width of an average character). This command must appear first before any other content in a paragraph
\.sk[N]	Insert n spaces. When converting to HTML, these should be understood as
Must Not Use	
\.sp[N]	This is an instruction to go "down" N vertical lines, without resetting the horizontal cursor – this is not appropriate
\.ce	End output and center the next line – the concept of "center" is not properly defined. If this level of formatting is desired, use a different display format

Note: for further documentation of FT data type, see
http://www.healthintersections.com.au/?page_id=441

PIT

message-24: The PIT format SHOULD not be used in display formats

The PIT format is being phased out, and is deprecated here. The next version of this profile will replace SHOULD NOT with SHALL NOT.

message-25: PIT Commands SHALL always be terminated at the end of the line with a matching termination command

sender-18: Sending applications SHOULD NOT expect the command to continue to wrap in the displaying software

receiver-26: Receivers *should* wrap the state (bolding, etc) if there is no matching termination command at the end of the line

These overlapping requirements are meant to remove uncertainty while still supporting the huge amount of PIT content that already exists in production.

sender-19: PIT Line numbers <300 or >390 SHALL not be used

These are not part of the display format, and overlap with other parts of the message

Format Rules

Note that the full PIT specification is available online at
http://www.healthintersections.com.au/?page_id=285

Feature	Description
Must Support:	
BGnn	Specify a background color (see colour table below) The default colour is BG99, and the colour should always be reset at the end of the line
FGnn	Specify a text color (see colour table below) The default colour is FG99, and the colour should always be reset at the end of the line
SBLD/EBLD	Start and end bolding
SUND/EUND	Start and end underlining
Must Not Use	
SBLK, EBLK	Blinking – most targets do not support blinking
PIpp	Pitch control – why use this?
FOff	Meaning unknown?

Colour table:

00 = Black	06 = Brown	12 = Light Red
01 = Blue	07 = Light Grey	13 = Light Magenta
02 = Green	08 = Dark Grey	14 = Yellow
03 = Cyan	09 = Light Blue	15 = White
04 = Red	10 = Light Green	
05 = Magenta	11 = Light Cyan	99 = Default

Each of these except for 12 and 13 have matching HTML colours. For 12 and 13, use Salmon and Violet respectively

RTF

Although RTF is widely supported, there are many implementations of variable quality. RTF is based on the private internal format for Word, and changes with Word. Most implementations support a subset of the features

Feature	Comments
Must Support:	
Tables	*No nested tables allowed*
Hyperlinks	
Images	(bmp, jpg, png) (but not EMF)
Lists	Nested lists must be displayed with indication of logical nesting, but nesting itself is not required
Must Not Use	
Embedded objects	
Embedded fonts	
Smart shapes / other Drawing objects	Convert to images
Smart tags	Bad functionality
Change tracking	Often misinterpreted by non-word RTF implementations
Section specific page layout	
Comments	
Word forms	
Optional Features	
Columns	
Header/footer/cross references	
Fields	Fields must be up to date, so text content will be shown if field is ignored
Watermark	

XHTML

This documentation is based on HTML 4. Chapter references are to the HTML 4.0 specification. When HTML 5.0 is finalised, the feature list will be reviewed. However most new HTML 5 features are not relevant or not appropriate in display segments.

message-26: HTML SHALL be properly formed XHTML

message-27: The HTML SHALL specify the character set

The list of valid character sets for HTML is much wider than for the message as specified above. Any character encoding that is round trip compatible with Unicode should be supported, and also 8859\1.

Feature	Comments

Must Support:	
Text format items	html elements defined in chapters 7 - 11, 15
anchors (<a/>)	Including href and name attributes. The _target attribute does not have to be honoured
Images	
Must Not Use	
external style sheets	do not specify external stylesheet in xhtml header. (Internal stylesheets are allowed, but care must be taken to ensure that content displays on multiple targets including mobile devices – note that receivers may strip internal style sheets; this must be safe)
Embedded objects	<embed and <object
forms	Forms and inputs are not allowed
base/link/xlink	web specific content
frames / iframes	
scripts	javascript/vbscript, etc, either inline or as external references
Optional Features	
Image maps	

TODO: what to do about these two:

- Note that a forthcoming TR from Standards Australia (reference) makes additional recommendations regarding the use of XHTML sections; these should be understood and honoured by receivers.
- Note that a forthcoming TR from Standards Australia makes additional recommendations for referencing images in OBX segments; these should be understood and honoured by receivers

PDF

PDF is the most interoperable of the documents (as befits its name and intent), but there are still interoperability problems associated with its use in multiple toolkits on multiple platforms

Feature	Comments
Must Support:	
compression	
comments	mainly because this seems to be implemented in all toolkits
Must Not Use	
Encryption	
Password protection	
Restrict printing / copying	
Optional Features	
Embedded fonts	Content should not depend on availability of correct font. (Careful with scientific characters – use Unicode as much as possible)
digital signature	
restrict changes	Changes are not allowed whether this pdf flag is set or not