



iCare+

Interoperability interfaces specification

	ICARE+ Interoperability interfaces specification	
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Version history		
Version	Date	Object of the revision
01	2022/01/03	Creation of the document
02	2022/05/05	Update OBR, OBX and TXA segments Update date/time format

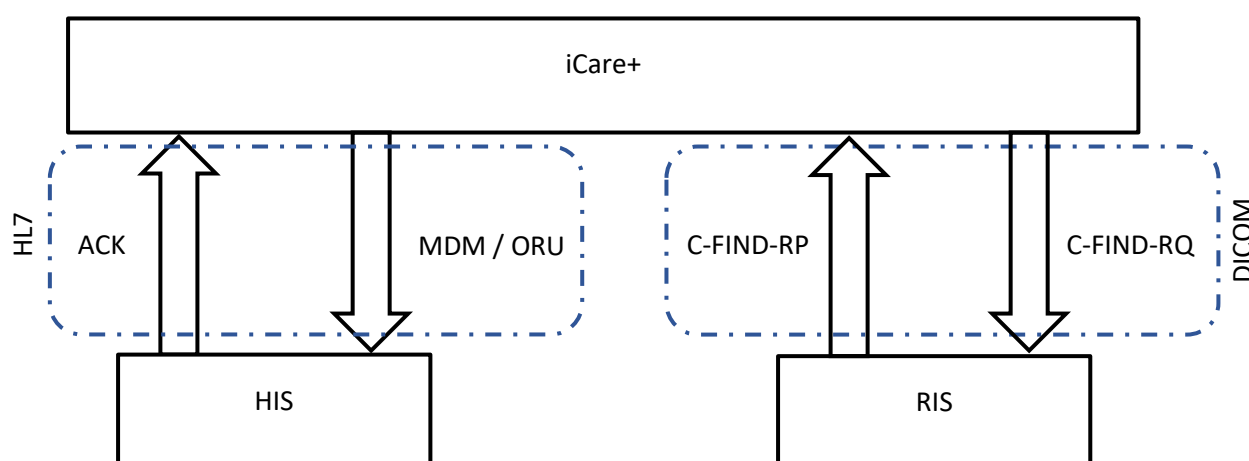
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1. Introduction

iCare+ system is intended to capture image data and generate hysteroscopy and colposcopy reports (in PDF format). It can communicate with a HL7 based HIS and retrieve a modality Worklist through a standard DICOM interface.

Communication flow is presented just below:



2. HL7 interface of iCare+

2.1.Introduction

Through its HL7 interface, iCare+ can send result messages when a procedure is finished.

iCare+ is compatible with HL7 version 2.5.1. The HL7 communication uses MLLP protocol via TCP/IP socket.

The Lower Layer Protocol defined by the HL7 Standard is implemented as follow:

- Message Start Character: 0x0B
- Segment End Character: 0x0D
- Message Stop Characters: 0x1C and 0x0D
- Character encoding: UTF-8

All messages sent by iCare+ must be acknowledged by the HIS with the HL7 ACK message.

2.2.MSH segment

The HL7 MSH (Message Header) segment is present in every HL7 message type.

MSH Segment in all messages				HL7 Version opt.	iCare+ Attribute
Field	Element name	Subs.	Component name		
1	Field separator	1		R	Constant value:
2	Encoding character	1		R	Constant value: ^~\&
3	Sending application	1		O	Modality name
4	Sending facility	1		O	

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5	Receiving application	1		O	HIS-Name
6	Receiving facility	1		O	
7	Date / time of message	1		O	Current datetime ¹⁾
9	Message type	1	Message code	R	One of: MDM – See 2.3.1 ORU – See 2.3.2
		2	Trigger event	R	T02 for MDM R01 for ORU
		3	Message structure	R	MDM_T02 for MDM ORU_R01 for ORU
10	Message control ID	1		R	Current datetime stamp down to seconds followed by 4 digit rolling number (reset after rolls over or restart of iCare)
11	Processing ID	1		R	Constant value: P
12	Version ID	1		R	Version
17	Country code	1		O	
18	Character set	1		O	Encoding characters set
19	Principal language of message	1		O	

¹⁾ Date time stamp down to seconds formatted as: YYYYMMDDhhmmss+/-zzzz where [+/-zzzz] is the offset from UTC.

2.3.Outgoing messages

iCare+ can send reports using one of the following messages:

- MDM
- ORU

2.3.1. MDM messages

The HL7 interface of iCare+ creates the following MDM (one message per report) messages:

- MDM message type: T02
- MDM message structure:

MSH	Message Header segment
EVN	Event Type segment
PID	Patient Identification segment
PV1	Patient Visit segment
ORC	Common Order segment
OBR	Observation Request segment
TXA	Transcription Document Header segment
OBX	Observation Results segment

Example of created MDM message:

```
MSH|^~\&|ICARE|DELMONT-
IMAGING|DPI|DPI|20220103101750+0200||MDM^T02^MDM_T02|202201031017500002|P|2.5.1|||FRA|UNICODE UTF-8|FRA
EVN|T02|20220103101750+0200
PID|1||IPP_12345^^^^PI||DUPONT^Martine^^^^L~MARCEAU^Martine^^^^D||19841115|F
PV1|1|O|Gyneco|||||||||VISIT_0001^^^^VN
```

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ORC|NW

OBR|1|||HYST^Hysteroscopie||20220103100000+0200|20220103100000+0200

TXA|1|OP|||20220103100000+0200|20220103100000+0200|||12345|||DO

OBX|1|ED|HYST^Hysteroscopie||^AP^PDF^Base64^JVBERi0xLjMKJcTl8uXrp/Og0MTG|||F||20220103100000+0200

2.3.2. ORU messages

The HL7 interface of iCare+ creates the following ORU (one message per report) messages:

- ORU message type: R01
- ORU message structure:

MSH	Message Header segment
PID	Patient Identification segment
PV1	Patient Visit segment
ORC	Common Order segment
OBR	Observation Request segment
OBX	Observation Results segment

Example of created ORU message:

MSH|^~\&|ICARE|DELMONT-

IMAGING|DPI|DPI|20220103122923+0200||ORU^R01^ORU_R01|202201031229230003|P|2.5.1|||FRA|UNICODE UTF-8|FRA

PID|1||IPP_12345^P||DUPONT^Martine^L~MARCEAU^Martine^D||19841115|F

PV1|1|O|Gyneco|||||VISIT_0001^VN

ORC|NW

OBR|1|||HYST^Hysteroscopie||20220103110000+0200|20220103110000+0200

OBX|1|ED|HYST^Hysteroscopie||^AP^PDF^Base64^JVBERi0xLjMKJcTl8uXrp/Og0MTG|||F||20220103110000+0200

2.4.Created message segments

2.4.1. PID segment

PID Segment in MDM and ORU messages				HL7 Version opt.	iCare+ Attribute
Field	Element name	Subs.	Component name		
1	Set ID	1		O	Constant value: 1
3	Patient ID List	1	ID number	R	IPP
		5	ID type code	O	Constant value: PI
5	Patient name	1	Family name	R	Patient's Last name
		2	Given name	O	Patient's First name
7	Date/Time of Birth	1		O	Patient's birth date ¹⁾
8	Administrative sex	1		O	Patient's Gender ²⁾

¹⁾ Date formatted as YYYYMMDD

²⁾ Gender: F = Female

2.4.2. PV1 segment

PV1 Segment in MDM and ORU messages				HL7 Version opt.	iCare+ Attribute
Field	Element name	Subs.	Component name		
1	Set ID	1		O	Constant value: 1

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2	Patient class	1		R	Constant value: O ¹⁾
3	Assigned patient location	1		O	
19	Visit number	1	ID number	O	Admission ID
		5	ID type code	O	Constant value: VN ²⁾

¹⁾ O = Outpatient

²⁾ VN = visit number

2.4.3. EVN segment

EVN Segment in MDM messages				HL7 Version opt.	iCare+ Attribute
Field	Element name	Subs.	Component name		
1	Event type code	1		B	Constant value: T02
2	Recorded date/time	1		R	¹⁾

¹⁾ Date time stamp down to seconds formatted as: YYYYMMDDhhmmss+/-zzzz where [+/-zzzz] is the offset from UTC.

2.4.4. ORC segment

ORC Segment in MDM and ORU messages				HL7 Version opt.	iCare+ Attribute
Field	Element name	Subs.	Component name		
1	Order control	1		R	Order control code ¹⁾

¹⁾ Order control codes: NW = New document, SC = Status changed (modification of document)

2.4.5. OBR segment

OBR Segment in MDM and ORU messages				HL7 Version opt.	iCare+ Attribute
Field	Element name	Subs.	Component name		
1	Set ID	1		O	Constant value: 1
4	Universal service ID	1	Identifier	R	Exam's code
		2	Text	O	Exam's name
6	Requested Date/Time	1		C	Exam's datetime ¹⁾
7	Observation Date/Time	1		C	Exam's datetime ¹⁾

¹⁾ Date/time down to seconds formatted as: YYYYMMDDhhmmss+/-zzzz where [+/-zzzz] is the offset from UTC.

2.4.6. TXA segment

TXA Segment in MDM messages				HL7 Version opt.	iCare+ Attribute
Field	Element name	Subs.	Component name		
1	Set ID	1		R	Constant value: 1
2	Document type	1		R	Constant value: OP ¹⁾
6	Origination date/time	1		O	Exam's datetime ²⁾
7	Transcription date/time	1		C	Exam's datetime ²⁾
8	Edit date/time	1		O	Report's edition datetime ^{2) 4)}

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12	Unique document number	1		R	Document unique ID
17	Document completion status	1		R	Constant value: DO ³⁾

1) OP = operative report

2) Date/time down to seconds formatted as: YYYYMMDDhhmmss+/-zzzz where [+/-zzzz] is the offset from UTC.

3) DO = Documented

4) Only present in case of modification of an existing report

2.4.7. OBX segment

OBX Segment in MDM and ORU messages				HL7 Version opt.	iCare+ Attribute
Field	Element name	Subs.	Component name		
1	Set ID	1		O	Constant value: 1
2	Value type	1		C	Constant value: ED ¹⁾
3	Observation identifier	1	Identifier	R	Exam's code
		2	Text	R	Exam's name
5	Observation value	2	Application ID	C	Constant value: AP ²⁾
		3	Type of data	C	Constant value: PDF
		4	Subtype	C	Constant value: Base64 ³⁾
		5	Data	C	Base 64 encoded report file
11	Observation result status	1		R	Constant value: F ⁴⁾
14	Date/time of observation	1		O	Report's datetime ⁵⁾

1) ED = embedded

2) AP = application

3) Encoding type

4) F = final

5) Date/time down to seconds formatted as: YYYYMMDDhhmmss+/-zzzz where [+/-zzzz] is the offset from UTC.

3. DICOM interface of iCare+

The MWL-SCU AE is invoked to get all the exams scheduled for the day.

iCare+ attempts to establish an association whenever the users invoke a DICOM modality worklist query.

The maximum PDU size defined is 16384 bytes.

3.1.MWL-SCU AE specification

3.1.1. SOP classes

iCare+ provides standard conformance to the following SOP Classes:

SOP class name	SOP class UID	SCU	SCP
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Yes	No

3.1.2. Presentation context

Abstract syntax		Transfer syntax		Role	Extended negotiation
Name	UID	Name List	UID List		
Modality Worklist Information Model - FIND	1.2.840.10008.5.1.4.31	Implicit VR Little Endian	1.2.840.10008.1.2	SCU	None

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3.1.3. C-FIND request

iCare+ establishes an association to the remote AE, sends the C-FIND requests and closes it after receiving the responses. If the C-FIND request times out, the association is released, and the failure is reported to the user.

It uses the following query keys in the C-FIND request:

Tag	Attribute Name	Requested value	Comment
(0010,0010)	Patient's name	*	
(0010,1001)	Other Patient names		
(0010,0020)	Patient ID	*	
(0010,0030)	Patient's Birth Date		
(0010,0040)	Patient's sex		
(0040,1001)	Requested Procedure ID		
(0038,0010)	Admission ID		
(0008,0050)	Accession Number		
(0038,0300)	Current Patient's location		
(0008,0090)	Referring Physician's Name		
(0032,1060)	Requested Procedure Description		
(0040,0100)	Scheduled Procedure Step Sequence		
> (0008,0060)	Modality	OT	
> (0040,0001)	Scheduled Station AE Title	ICARE	
> (0040,0002)	Scheduled Procedure Step Start Date	¹⁾	
> (0040,0003)	Scheduled Procedure Step Start Time	000000-235959	
> (0040,0011)	Scheduled Procedure Step Location		
> (0040,0009)	Scheduled Procedure Step ID		
> (0040,0007)	Scheduled Procedure Step Description		
> (0040,0006)	Scheduled Performing Physician Name		
(0032,1064)	Requested procedure Code Sequence		
> (0008,0100)	Code Value		

¹⁾ Current date formatted as YYYYMMDD

iCare+ checks for the following status codes in the response to the C-FIND request:

- Success (0000)
- Pending (FF00)
- Pending with warning (FF01)

All others status will be considered as errors, and values rejected.