HL7

3.23.3.0 | User Guide

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AMBRA™

An Intelerad Company

INTENDED USE

Ambra PACS software is intended for use as a primary diagnostic and analysis tool for diagnostic images for hospitals, imaging centers, radiologists, reading practices and any user who requires and is granted access to patient image, demographic and report information.

Ambra ProViewer, a component of Ambra PACS, displays, modifies and manages diagnostic quality DICOM images including 3D visualization and reordering functionality.

Lossy compressed mammographic images and digitized film screen images must not be reviewed for primary image diagnosis or image interpretations. Mammographic images may only be viewed using cleared monitors intended for mammography display.

Not intended for diagnostic use on mobile devices.

CONTRAINDICATIONS—None.

Caution: Federal law restricts this device to sale by or on the order of a physician. Fluency in English is required as a prerequisite for operating the Ambra PACS product.

This system does not replace the education, skill, and judgment of properly trained medical practitioners. Only properly trained and qualified individuals shall have access to and use Ambra PACS and must know of its functionality, capabilities and limitations. Typical users of this system are trained health professionals, physicians, nurses, and technologists.

Downloaded Images, Workstations and Isolated Installs: You and your users must maintain Ambra PACS with the most current versions, including available updates and upgrades. Delaying or refusing updates or upgrades following a recall may result in a non-compliant AmbraPACS.

SAFETY ISSUES: AmbraPACS is a medical device, and as such, must meet medical device safety and effectiveness requirements imposed by national regulations. Any unmonitored or unconnected use of AmbraPACS, or use of AmbraPACS without a valid right may put the health and safety of patients at risk as you will not be advised of the availability of any software patch, bug fix, update or upgrade nor will be informed of Field Safety Notices, Medical Device Recalls or Advisory Notices related to AmbraPACS. Client and authorized users must consult national regulatory site(s) to be informed of Field Safety Notices, Medical Device Recalls or Advisory Notices related to AmbraPACS. Intelerad does not have access to authorized users systems to implement corrections to prevent (or correct) occurrences of patient safety issues. You are responsible to flow down recall and patient safety information to your users. The user of the medical device must report any serious incident that has occurred in relation to the medical device to the manufacturer (Intelerad) and the competent authority having jurisdiction in their locale.

Referring Physicians Use: Images for authorized referring physicians may not be of diagnosis quality and should not be used for diagnostic purposes.

DICOM Grid, Inc. dba Ambra Health
305 Church at N Hills St, 6th Floor,
Raleigh, North Carolina 27609 USA

Ambra UDI is: **+AMBRAPACS0/$$73.23.3.0D**

DECLARATION OF CONFORMITY

Declaration of Conformity is issued under the sole responsibility of the DICOM Grid, Inc. dba Ambra Health.

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This guide provides an overview of Ambra HL7 functionality. HL7 is one of the standard ways of passing medical information between systems.

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OBTAINING PRINTED DOCUMENTATION

Intelerad offers printed and bound versions of product documentation free of charge. To request printed copies of Intelerad documentation, contact your Client Success manager. The printed documents will be provided within 7 days or less.

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CONTACTING INTELERAD TECHNICAL SUPPORT

Your PACS administrator can assist you with any issues you may encounter. If you require additional assistance, you can contact AmbraTechnical Support, 24 hours a day, seven days a week.

To contact us:	Use:
On the Internet	https://serviceportal.intelerad.com/csm
By telephone	Toll-free: 888-315-0790

These coordinates and a wealth of other information are also available on the Intelerad Service Portal.

https://serviceportal.intelerad.com/csm

You should regularly check the Intelerad knowledge base for the latest version of the documentation.

Ambra PACS is a cloud-based product. Customers are informed of upcoming releases via multiple channels to ensure they stay up-to-date with the latest developments and enhancements. All customers receive timely and comprehensive e-mails from our marketing team, which not only highlight the release dates but also describe in detail the new features and functionalities that will be available in the upcoming release. When a new version of the software becomes available it will automatically upgrade on the appointed release date of that version. Please contact support with for any questions regarding upgrades.

When you contact AmbraTechnical Support to report a problem, please have at hand the following information, as applicable:

- client code and location of your Ambra PACS installation
- full error message and the steps required to reproduce the problem
- AE Titles of the affected devices
- operating systems of any affected machines
- description of the problem and when it first occurred

If the problem affects a particular study, please also provide the following:

- patient ID or patient number (M.R.N.)
- accession number/requisition number
- modality type and name

For security information, please open a ticket with Intelerad Technical Support.

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INTRODUCTION

This guide provides an overview of the Ambra HL7 functionality. HL7 is one of the standard ways of passing medical information between systems. Ambra can both receive (incoming) and send (outgoing) HL7 messages. In terms of receiving, Ambra supports orders (ORM^O01), reports (ORU^R01), and admit, transfer, discharge messages (ADT^A08 or ADT^A31). In terms of sending, Ambra supports HL7 message types like orders (ORM^O01), reports (ORU^R01), and patient demographic queries (QRY^A19).

This guide will discuss the following topics:

- Incoming (to Ambra) messages and workflows
- Outgoing (from Ambra) messages and workflows
- Sample messages
- HL7 message segments and fields

Ambra Gateway & Account Configuration

Ambra transmits (sends and receives) HL7 messages via Ambra Gateway. Ambra Gateway is a piece of software that sits on a Microsoft® Windows® machine (VM or physical appliance) in the sending or target network. Ambra also supports a cloud Gateway if preferred.

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BROWSER REQUIREMENTS

Microsoft Internet Explorer 9 or later, Microsoft Edge, Apple Safari, Google Chrome, Firefox.

INCOMING HL7 MESSAGES

Ambracomplies with HL7 2.3. The messages Ambrareceives as well as the key fields for these messages are outlined below.

ORU^R01 HL7 message

An ORU^R01 message is an unsolicited transmission of an observation. Colloquially, we refer to ORU^R01s as reports. It is highly useful to store the report with the imaging. Ambra receives the ORU^R01 and ties the report to the study, typically using the accession number as the linking key. In addition, Ambra uses HTML that Ambra configures to make the ORU^R01 appear as a formatted report. These are the incoming ORU workflows that Ambra supports:

Site sends an ORU^R01 to Ambra

Upon receipt, Ambra automatically queries and retrieves the study from the PACS or VNA. Upon receipt of the complete package (report and study), Ambra automatically shares the package with the referring physician.

Site sends an ORU^R01 to Ambra after the study already exists in Ambra

As soon as the ORU^R01 is received, the report appears attached to the study. Those with the appropriate permissions can search for, find and review the study and report at any time.

Below is an example ORU^R01 message. The key fields are the acces- sion number and the patient MRN. These are the linking keys between the report and the study. The accession number is generally pulled from OBR1 or OBR2 and the MRN is generally

pulled from PID2 or PID3 (see red text in sample message below). The field must contain only the accession number. It cannot contain any ^ or sub-fields. Although OBR2 or OBR3 is typically used, any segment and field in the ORU^R01 message can be defined as the field to link the report with the study.

See red text in sample message below.

MSH|^~\&|EMR|EMR|||20040111181023|1148|ORU^R01|487|D|2.3|| PID|1||1 43560^^^^EPI||ECKLES^SAMUEL^A.^^MR.^||19730211|M|ECKLES^SAMUEL^A^^^||4 2 NORTH AVE^^CAMBRIAmbraE^MA^02138^US^^^DN| DN|(857)721-3255|(857)721-3255|||1111246~11480172~7734 |114-80-2122||||^^NEWYORK^^^

PD1|||FRANKIN NEAR EAST LOCATION (CENTRAL)^^537| Outgoing Imaging Orders and Results Interface Technical Specification 10 PV1|||^^^EMR^^^^^||||||||||||||||522320||||||||||| |||||||||||||||||||||||V ORC||437951^EPC|2223^EP C||Final||^^^200312071730^^^^||200401211810|1152^KARIS^LUCAS^^^^||757^SP ETZLER^CHRISTIAN^J^^^|467^^^537^^^^^|(857)259-9167|| OBR|1|437951|2255^EPC|73000^X-RAY CLAVICLE^^^X-RAY CLAVIC|||||||||||||7 57^SPETZLER^CHRISTIAN^J^^^|(857)259-9167||||||||||Final||^^^200310071730^^^^|||||2149^HITACHI^BENJAMIN^^^^||1148010^1A ^FRANKLIN^X-RAY^^^|^| Ambra1|||I9|810^CLAVICLE FRACTURE^I9|CLAVICLE FRACTURE||OBX|1|ST|GDT|1|X-ray suspected Clavicle fx. The quality of the film was good.|||A

|||Final|||||1148010^1A^FRANKLIN^X-RAY^^^ OBX|2|ST|IMP|1| Abnormal, Fracture Present|||A|||Final|||||1148010^1A^FRANKLIN^X-RAY^^^ OBX|3|ST|IMP|1|Left lateral; surgery required|||A|||Final|||||1148010^1A^FRANKLIN^X-RAY^^^

ORM^O01 HL7 message

An ORM^O01 message is a general order message that contains ap- pointment and personal patient details. These are the incoming ORM workflows that Ambra supports:

Outside study is sent to Ambra

Outside orders are sent to Ambra from the target facility. In Ambra, the order is manually associated with study, and order information (MRN, accession number, patient name, DOB, gender, and study description) is used to update the study. After the update, study is sent to PACS. Study flows automatically into PACS because it has the right target PHI.

ORMs are used to drive routing: sending to referring physicians, shar- ing with specified physicians, sending to DICOM devices, and any other DICOM destination.

The ORM auto associates with the study using accession number as a linking key, and the routing rule is configured to fire based on informa- tion in a specified segment and field.

Below is an example ORM^O01 message. The key field is the accession number. This is the linking key between the order and the study. The accession number is generally pulled from OBR1 or OBR2 (see red type in sample message below). The field must contain only the accession number. It cannot contain any ^ or sub-fields. Although OBR2 or OBR3 is typically used, any segment and field in the ORM^O01 message can be defined as field to link the report with the study.

See red text in sample message below.

MSH|^~\&|EMR|EMR|||20041111072701|1148|ORM^O01|497|D|2.3||
PID|1||43560^^^^EPI||ECKLES^SAMUEL^A.^^MR.^||19730211|M||AfrAm|42 NORTH AVE^^CAMBRIAmbraE^MA^02138^US^^^DN|DN| DN|(857)721-3255-|(857)721-3255||S||11480003~2514705~7603~13412|114-82-1544||||^^^MA^^NTE|1||Comments go here

PD1||||FRANKLIN NEAR EAST LOCATION (CENTRAL)^^537|757^SPETZLER^CHRISTIAN^J^^^
PV1|||^^^EMR^^^^^|||||||||||||||||509502|||||||||||||||||||||||||||||||||||||V

ORC|NW|363463^EPC|1858^EPC||Final||^^^200308151200^^^^||2004

01220727|1152^KARIS^LUCAS^^^^||757^SPETZLER^CHRISTIAN

^J^^^|467^^^537^^^^^|(857)259-9167||

OBR|1|363463|1858^EPC|73610^X-RAY ANKLE 3+ VW^^^X-RAY ANKLE|||||||||||||757^SPETZLER^CHRISTIAN^J^^^|(857)259-9167|||||||||Final||^^^200308

151200^^^^|||||2149^HITACHI^BENJAMIN^^^^||1148010^1A^FRANKLIN^X- RAY^^^|^|

Ambra1||I9|824^ANKLE FRACTURE^I9|ANKLE FRACTURE||

ORMs are also used to drive DICOM modality worklist in the modality. The appointment/order is made in the EMR or practice management system; the order is sent to Ambra, viAmbra Gateway; Ambra pulls the information from the ORM and acting as

the service class pro- vider (SCP) makes the information from the order available for DICOM modality worklist queries. When the patient arrives for a scan, instead of keying the MRN, accession number, name and other study informa- tion into the modality, the tech simply picks the patient name from a picklist.

Ambra Gateway must be installed

Ambra Gateway is the service class provider (SCP). This means that Ambra Gateway receives MWL queries from modalities, which are acting as the service class user (SCU).

MWL is a standard supported by most modalities

For the modality to be set up to query the modality worklist, the customer should not need to pay the modality vendor. The customer should either be able to do it themselves or do it through basic modality support.

The queries are part of the log.log file in Ambra Gateway

This is a useful resource during configuration.

Configuration

Appointment system/EMR/HIS

Configure the appointment system/EMR/HIS to send HL7 orders to Ambra Gateway. You must provide the appointment system/EMR/HIS the following information:

- IP address of Ambra Gateway

- HL7 listening port of Ambra Gateway. By default, this is 12000. See hl7_listening_ ports in Ambra Gateway.

- The orders (ORM^O01) should contain the following information. Please note that fields formatted like OBR4-2 mean the second subfield in OBR4.

    ○ MRN in PID2 or PID3

    ○ Patient name in PID5

    ○ Accession number in ORC3 or OBR3 or MHS10

    ○ Birth date in PID7

    ○ Sex in PID8

- Modality in OBR20

- Requested procedure id in OBR4-1 or ORC2

- Requested procedure description in OBR4-2

- Requested procedure step start date in OBR27-4

- Requested procedure station aetitle in OBR19

Below is an example ORM^O01 message that is part of the modality worklist workflow.

MSH|^~\&|EMR|EMR|||20041111072701|1148|ORM^O01|497|D|2.3||
PID|1||43560^^^^EPI||ECKLES^SAMUEL^A.^^MR.^||19730211|M||AfrAm|4 2 NORTH
AVE^^CAMBRIAmbraE^MA^02138^US^^^DN|DN| DN|(857)721-3255|(857)721-
3255||S||11480003~2514705~7603~13412|114-82-1544||||^^^MA^^

NTE|1||Comments go here

PD1|||FRANKLIN NEAR EAST LOCATION
(CENTRAL)^^537|757^SPETZLER^CHRISTIAN^J^^^PV1|||^^^EMR^^^^^|||||||||||||||||509
502|||||||||||||||||||||||||||||||||||||V

ORC|NW|363463^EPC|1858^EPC||Final||^^^200308151200^^^^||200401220727|1
152^KARIS^LUCAS^^^^||757^SPETZLER^CHRISTIAN^J^^^|467^^^537^^^^^|
(857)259-9167||

OBR|1|363463|1858^EPC|73610^X-RAY ANKLE 3+ VW^^^X-RAY ANKLE

|||||||||||||757^SPETZLER^CHRISTIAN^J^^^|(857)259-9167||||||||Final||^^^200308
151200^^^^|||||2149^HITACHI^BENJAMIN^^^^||1148010^1A^FRANKLIN^X- RAY^^^|^|

Ambra1||I9|824^ANKLE FRACTURE^I9|ANKLE FRACTURE||

Ambra

Enable the orders_from_hl7 account switch. This must be done via the account/set call in the API.

Create the modality as a destination where:

- Port is filled in

- AE title is filled in

- IP address is filled in

- Type = DICOM (it defaults to DICOM if configured in the UI)

Remember that Ambra is acting as the SCP in this process, meaning it is receiving queries from the modality.

Modality

Modality worklist needs to be configured on the modality. This typi- cally means a configuration checkbox and these fields:

- SCP (Ambra Gateway) IP address

- SCP (Ambra Gateway) ae title

- SCP (Ambra Gateway) port

- Also, please note that the modality must be able to talk with Ambra Gateway.

Use

Patient arrives.

Tech picks patient from worklist on modality workstation. All information from appointment/order is written to study.

ADT^A08, ADT^A31, ADT^A04, ADT^A34 and SIU messages

ADT and SIU messages are used to sync data in your MPI (master patient index) and Ambra. This is hugely valuable. This is how ADT and SIU messages are used in Ambra:

Whenever there is a change to a patient record, an ADT message is sent to Ambra.

The MRN is used to associate the ADT with the various studies that share the MRN. The PHI from the ADT including name, DOB, gender is written to the studies that share the MRN.

For ADT^A08 messages, MRN is updated through the value in PID2, name through the value in PID5, DOB through the value in PID7, and gender through the value in PID8.

For ADT^A34 messages, Ambra looks at the change in value from MRG1 and updates using PID2, name through the value in PID5, DOB through the value in PID7, and gender through the value in PID8.

ADT Messages and SIU Messages can be used to create new patients.

ADT^A04 messages, ADT^A08, and SIU messages can be used to create new patients. For ADT^A04, ADT^A08, and SIU messages, Name almost always comes from PID5, DOB from PID7, and Gender from PID8. Email and phone depends on the version of HL7. Typically in pre-2.7, these segments are in PID13. In 2.7 or later, these segments are in PID40. Ambra is capable of map- ping to whichever segments are needed for phone and email.

As a note, please leave PID19 (SSN) blank.

Below is an example ADT^A31 message. The key field is the MRN. This is the linking key between the ADT message and the study or studies. The MRN is generally pulled from PID2 or PID3.

See red text in sample message below.

MSH|^~\&|HQ|A^HH|||201506130206||ADT^A31|082057154L0027316745|D|2.2
EVN|A31|201508190206||HPIU|ANWILSON

PID|0001|90442421|090442421^^^HQA^MR~90442421^^^HQ^PI||SMITH^ALB

ERT||19920430|M||X|||||ENG|S|CAT|||^01

PV1|0001|N||||||||||||||||||||||||||||||||||||||||||||||||||||||||^^^^^^^^^^PERSONALDOC

ZPI|0001||||||||||20150818|N|||NONE^UNEMPLOYED

ZID|0001|||||04|""

ZV2|||Y||||||||||||||||U|||||||||N

ZEZ|N

OUTGOING HL7 MESSAGES

ORU^R01 HL7 messages

The Ambra HL7 generator is very flexible. The messages described below are the most common messages Ambra generates; however, Ambra can generate other types of HL7 messages as required.

ORU^R01 messages are used to send reports to RIS, EMR or patient portal systems.

Common workflows include:

A report is made using Ambra's reporting engine.

When complete, the report can be sent via ORU^R01 to a target RIS or EMR.

An encapsulated PDF is sent to an outside destination.

A PDF can be sent in an HL7 as a base64 encoded encapsulated PDF.

An encrypted URL link is commonly sent from Ambra to an EMR or a patient portal via an ORU^R01 generated by Ambra's HL7 engine.

For more information on encrypted URL links, please contact Ambra. In addition to being an ORU generator, Ambra can enrich ORUs received from other systems with an encrypted URL link or other data and then forward the enriched ORU to downstream RIS or EMR systems.

Below is an example ORU^R01 message with a URL link embedded in the message.

See red text in sample message below.

```
MSH|^~\&|RAD|^005^|||||ORU|0000000741|P|2.5||
PID|||14055||SMITH^ANDREA||19520908|F||||||||||| PV1|||ENT||||||

OBR|||8999059211|NECK^1HEAD_NECK_PETCT||||||||||||||||||||| |||||||||||||
OBX|1|URL|||REDIRECT LINK GOES HERE|||||||
```

ORM^O01 HL7 messages

Ambra generates ORMs as part of our automated study PHI normalization process, which enables no touch outside study ingestion. The outside procedure code is automatically determined, the order is automatically created and written to the study, and the study is automatically pushed to PACS. The workflow is:

Ambra receives an outside study that is being sent to a downstream PACS.

As the study is coming from the outside, the MRN, the accession num- ber and possibly the patient name, date of birth and gender will need to be normalized to the target system's information. Ambra generates an ORM and sends it to the target's RIS or EMR. The ORM includes the patient information, the outside procedure code, and all other relevant information that can be scraped off the study including modality, study description, study date, image count, and any other data the target RIS or EMR requires. The RIS or EMR receives Ambra's order, automatically does a patient lookup, and if there is a match, automatically generates a real order, and sends the order to Ambra. Ambra receives the order, automatically applies the order information to the study, and approves the study, which triggers a send to PACS.

Below is an example ORM^O01 message that can help drive the workflow described above.

```
MSH|^~\&|SOARIAN|Target system|||20141119125329||ORM^O01|726976|T|2.4
PID|||1006551^^^^MR ||ZZTRAIN^AMY||19630506000000|F|||||||||||

ORC|NW|

OBR||5789345|||||||||O|FALSE||||

ZAI|DBID||||<Db ID>||||||||||||||
```

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MESSAGE SEGMENTS AND FIELDS

Ambra supports message segments and fields as described here:
http://www.hl7.org/implement/standards/product_brief.cfm?product_id=185

RECENT UPDATES

Receiving HL7 Messages

Ambra Gateway can be configured to receive HL7 messages in either UTF-8 (default) or Windows-1252 encoding.

HL7 Splitter

The HL7 splitter allows the Gateway to push HL7 messages directly to any HL7 destination on the local network. In parallel, the messages are uploaded to the Ambra cloud. This does not require internet access, so if there is an outage, the gateway will continue to push messages to the local destination.

ADT Messages

You can now use ADT messages instead of ORMS to enable a modality worklist.