Integrating the Healthcare Enterprise

IHE Patient Care Device (PCD) Technical Framework

Volume 2
PCD TF-2
Transactions

Revision 3.0 - Final Text
October 11, 2013

CONTENTS

1 Introduction

Integrating the Healthcare Enterprise (IHE) is an initiative designed to stimulate the integration of the information systems that support modern healthcare institutions. Its fundamental objective is to ensure that, in the care of patients, all required information for medical decisions is both correct and available to healthcare professionals. The IHE initiative is both a process and a forum for encouraging integration efforts. It defines a technical framework for the implementation of established messaging standards to achieve specific clinical goals. It includes a rigorous testing process for the implementation of this framework and it organizes educational sessions and exhibits at major meetings of medical professionals to demonstrate the benefits of this framework and encourage its adoption by industry and users.

The approach employed in the IHE initiative is not to define new integration standards, but rather to support the use of existing standards, HL7, IEEE, DICOM, IETF, and others, as appropriate in their respective domains in an integrated manner, defining configuration choices when necessary. When clarifications or extensions to existing standards are necessary, IHE refers recommendations to the relevant standards bodies.

This initiative has numerous sponsors and supporting organizations in different medical specialty domains and geographical regions. In North America the primary sponsors are the American College of Cardiology (ACC), the Healthcare Information and Management Systems Society (HIMSS) the Radiological Society of North America (RSNA), and the American College of Clinical Engineering (ACCE). IHE Canada has also been formed. IHE Europe (IHE-EUR) is supported by a large coalition of organizations including the European Society of Cardiology (ESC), European Association of Radiology (EAR) and European Congress of Radiologists (ECR), the Coordination Committee of the Radiological and Electromedical Industries (COCIR), Deutsche Röntgengesellschaft (DRG), the EuroPACS Association, Groupement pour la Modernisation du Système d'Information Hospitalier (GMSIH), Société Française de Radiologie (SFR), and Società Italiana di Radiologia Medica (SIRM). In Japan IHE-J is sponsored by the Ministry of Economy, Trade, and Industry (METI); the Ministry of Health, Labor, and Welfare; and MEDIS-DC; cooperating organizations include the Japan Industries Association of Radiological Systems (JIRA), the Japan Association of Healthcare Information Systems Industry (JAHIS), Radiological Society (JRS), Japan Society of Radiological Technology (JSRT), and the Japan Association of Medical Informatics (JAMI). Other organizations representing healthcare professionals are invited to join in the expansion of the IHE process across disciplinary and geographic boundaries.

1.1 Overview of the Patient Care Device Technical Framework

This document, the IHE Patient Care Device Technical Framework Volume 2 (IHE PCD TF-2), defines specific implementations of established standards to achieve integration goals for the Patient Care Device domain. Such integration promotes appropriate sharing of medical information to support optimal patient care.

The IHE PCD TF will be expanded annually, after a period of public review, and maintained regularly through the identification and correction of errors.

The PCD TF identifies a subset of the functional components of the healthcare enterprise, called IHE actors, and specifies their interactions in terms of a set of coordinated, standards-based transactions. It describes this body of transactions in progressively greater depth.

The present volume (PCD TF-2) provides detailed technical descriptions of IHE Patient Care Device transactions that support the IHE Patient Care Device Integration Profiles defined in the IHE Patient Care Device Technical Framework Volume 1.

The PCD TF is part of a related set of IHE Technical Frameworks, comprised of the following domain-specific documents:

- IHE Cardiology Technical Framework
- IHE IT Infrastructure Technical Framework
- IHE Laboratory Technical Framework
- IHE Patient Care Coordination Technical Framework
- IHE Radiology Technical Framework

The IHE Patient Care Device Integration Profiles rely on, and reference, the transactions defined in those other IHE Technical Framework documents. For the conventions on referencing these other Frameworks, see Section 1.6.4 within PCD TF-1 of the IHE Patient Care Device Technical Framework. The latest version of all Technical Framework documents can be found at http://ihe.net/Resources/Technical_Frameworks

1.2 Overview of Volume 2

The remainder of Section 1 further describes the general nature, purpose and function of the Technical Framework. Section 2 presents the conventions used in this volume to define IHE transactions.

Sections 3 through 3.9 define the transactions in detail, specifying the roles for each Actor, the standards employed, the information exchanged, and in some cases, implementation options for the transaction.

The appendices following the main body of this volume provide technical details associated with the transactions.

1.3 Audience

The intended audience of this document is:

- IT departments of healthcare institutions
- Technical staff of vendors planning to participate in the IHE initiative
- Experts involved in standards development
- Those interested in integrating healthcare information systems and workflows

1.4 Relationship to Standards

The IHE Technical Framework identifies functional components of a distributed healthcare environment (referred to as IHE actors), solely from the point of view of their interactions in the healthcare enterprise. At its current level of development, it defines a coordinated set of transactions based on ASTM, DICOM, HL7, IEEE, IETF, ISO, OASIS and W3C standards. As the scope of the IHE initiative expands, transactions based on other standards may be included as required.

In some cases, IHE recommends selection of specific options supported by these standards; however, IHE does not introduce technical choices that contradict conformance to these standards. If errors in or extensions to existing standards are identified, IHE's policy is to report them to the appropriate standards bodies for resolution within their conformance and standards evolution strategy.

IHE is therefore an implementation framework, not a standard. Conformance claims for products must still be made in direct reference to specific standards. In addition, vendors who have implemented IHE integration capabilities in their products may publish IHE Integration Statements to communicate their products' capabilities. Vendors publishing IHE Integration Statements accept full responsibility for their content. By comparing the IHE Integration Statements from different products, a user familiar with the IHE concepts of actors and integration profiles can determine the level of integration between them. See Appendix H for the format of IHE PCD Integration Statements. IHE encourages implementers to ensure that products implemented in accordance with the IHE Technical Framework also meet the full requirements of the standards underlying IHE, allowing the products to interact, although possibly at a lower level of integration, with products that have been implemented in conformance with those standards, but not in full accordance with the IHE Technical Framework.

1.5 Relationship to Real-world Architectures

The IHE actors and transactions described in the IHE Technical Framework are abstractions of the real-world healthcare information system environment. While some of the transactions are traditionally performed by specific product categories (e.g., HIS, Clinical Data Repository, Radiology Information Systems, Clinical Information Systems or Cardiology Information Systems), the IHE Technical Framework intentionally avoids associating functions or actors with such product categories. For each Actor, the IHE Technical Framework defines only those functions associated with integrating information systems. The IHE definition of an Actor should therefore not be taken as the complete definition of any product that might implement it, nor should the framework itself be taken to comprehensively describe the architecture of a healthcare information system.

The reason for defining actors and transactions is to provide a basis for defining the interactions among functional components of the healthcare information system environment. In situations where a single physical product implements multiple functions, only the interfaces between the product and external functions in the environment are considered to be significant by the IHE initiative. Therefore, the IHE initiative takes no position as to the relative merits of an integrated environment based on a single, all-encompassing information system versus one based on

multiple systems that together achieve the same end. To illustrate most dramatically the possibilities of the IHE Technical Framework, however, the IHE demonstrations emphasize the integration of multiple vendors' systems based on the IHE Technical Framework.

1.6 Comments

285 IHE International welcomes comments on this document and the IHE initiative. They can be submitted using the Web-based comment form at http://ihe.net/PCD_Public_Comments or by sending an email to the co-chairs and secretary of the Cardiology domain committees at pcd@ihe.net.

1.7 Copyright Permission

290 Health Level Seven, Inc. has granted permission to the IHE to reproduce tables from the HL7 standard. The HL7 tables in this document are copyrighted by Health Level Seven, Inc. All rights reserved.

Use of copyrighted IEEE material in this technical framework from the ISO/IEEE 11073 standards is covered by the IEEE-SA Royalty-free permission guidelines.

295 Material drawn from these documents is credited where used.

2 Conventions

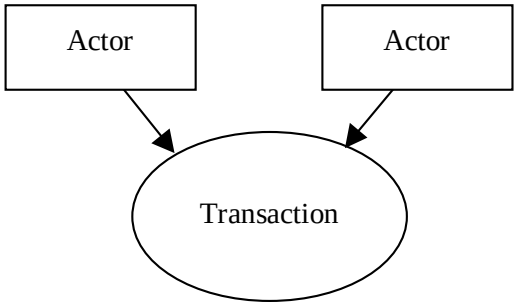
This document has adopted the following conventions for representing the framework concepts and specifying how the standards upon which the IHE PCD Technical Framework is based should be applied.

2.1 The Generic IHE Transaction Model

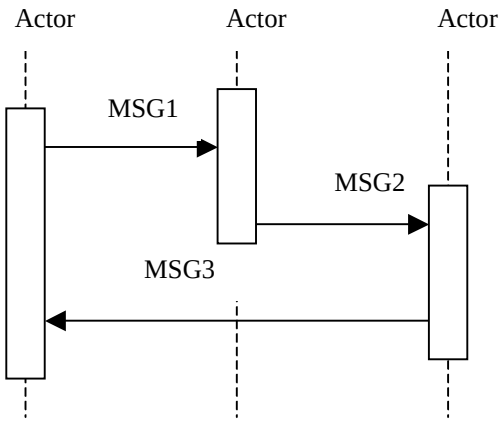
Transaction descriptions are provided in Section 3. In each transaction description, the actors, the roles they play, and the transactions between them are presented as use cases.

The generic IHE transaction description includes the following components:

- Scope: a brief description of the transaction.
- Use case roles: textual definitions of the actors and their roles, with a simple diagram relating them, e.g.,:



- Referenced Standards: the standards (stating the specific parts, chapters or sections thereof) to be used for the transaction.
- Interaction Diagram: a graphical depiction of the actors and messages that support the transaction, with related processing within an Actor shown as a rectangle and time progressing downward, similar to:



The interaction diagrams used in the IHE-PCD Technical Framework are modeled after those described in Grady Booch, James Rumbaugh, and Ivar Jacobson, The Unified Modeling Language User Guide, ISBN 0-201-57168-4. Simple acknowledgment messages are often omitted from the diagrams for brevity. One or more messages may be required to satisfy a transaction. Each message is represented as an arrow starting from the Actor initiating the message.

- Message definitions: descriptions of each message involved in the transaction, the events that trigger the message, its semantics, and the actions that the message triggers in the receiver.

2.2 HL7 Profiling Conventions

HL7 messages are described in this document using message level and segment level tables according to static definitions of "HL7 constrainable message profiles" (see HL7 v2.6 section 2B.6). For details of the HL7 message profiling conventions used in this Technical Framework, the reader is referred to Appendix F.

A message level table represents one IHE-constrained message structure with its list of usable segments. A segment level table represents the IHE-constrained content of one segment with its usable fields.

Message level tables are included in message subsections within each transaction section, and represent the static definition of the specified messages. A message table is followed by comments concerning the segment usage. The subsection describing a message also provides the descriptions of any segments that are specific to this message.

Only the segments that have a usage code R, RE, C or CE in at least one message are described. In other words, segments which are always optional (O) or not supported (X), are not described in the IHE PCD TF.

The common static definition of the HL7 acknowledgement (ACK) message is described in Appendix G, "HL7 Implementation Notes".

2.3 Use of Coded Entities and Coding Schemes

IHE does not produce, maintain or otherwise specify a coding scheme or other resource for controlled terminology (coded entities). For the IHE PCD transactions, however, observation identifiers should by preference be based on ISO/IEEE 11073-10101 Medical Device Communications - Nomenclature. A list of these terms and proposed additions to the standard is maintained collaboratively by IHE PCD and the US National Institute of Standards and Technology in the Rosetta Terminology Management Service project. Implementations shall use the terms defined in the current version of the Harmonized Rosetta Terminology (online access to terminology is at http://hit-testing.nist.gov:13110/rtmms/index.htm). See IHE PCD Technical Framework Volume 3 for further details and references. This vocabulary is based on terms from the ISO/IEEE 11073 Nomenclature where available, and where the Nomenclature does not currently contain a matching term, gives provisional vendor-neutral terms to be submitted to the ISO/IEEE 11073 Upper Layers committee as suggestions for adoption into the Nomenclature.

The Harmonized Rosetta terminology also covers units of measure. Both IEEE 11073 and UCUM terms are recognized, and it is recommended that both be given.

By the terms of reference of the Harmonized Rosetta terminology, a REFID (string-valued identifier) or a numeric code, once it is used to identify a terminology item, may not be reused to identify another concept for any purpose, regardless of whether the original usage of the terminology item may have been deprecated. This is to avoid any misidentification of codes and to make it unambiguously clear if a deprecated item is being used.

By local agreement covering a particular pairing of sending and receiving systems, terms not in the Harmonized Rosetta Terminology may be used if necessary to communicate the data, but it is strongly recommended instead to submit a term for inclusion there so it will be documented an available for wider use. If a term cannot be found in this way and a matching term is available in LOINC, then the next preference is to use the LOINC term. If LOINC also does not support a term then a SNOMED CT term may be used if available. In the cases where such resources are not explicitly identified by standards, by local agreement implementations may utilize any resource (including proprietary or local) provided any licensing/copyright requirements are satisfied, but it should be understood that such usage is not fully conformant to this Technical Framework, and will not pass IHE-sanctioned conformance tests. Parties using such terms shall take measures to end the non-conforming usage as soon as practicable by seeking to add a standardized term for each of their concepts with the help of the Rosetta Terminology Mapping work group.

3 IHE PCD Transactions

This section defines each IHE transaction in detail, specifying the standards used, the information transferred, and the conditions under which the transaction is required or optional.

3.1 PCD-01 Communicate PCD Data

This section specifies Transaction PCD-01 of the IHE Patient Care Device Technical Framework, which is used to transmit patient care device data between systems. Transaction PCD-01 is used by the Device Observation Reporter and Device Observation Consumer actors. Note that these actor names are linked to abstract functions rather than to physical devices; a Device Observation Reporter may be implemented in a freestanding system or it may be implemented in the Patient Care Device itself.

3.1.1 Scope

This transaction is used to communicate PCD Data from:

- A Device Observation Reporter (DOR) to a Device Observation Consumer (DOC).

3.1.2 Use Case Roles

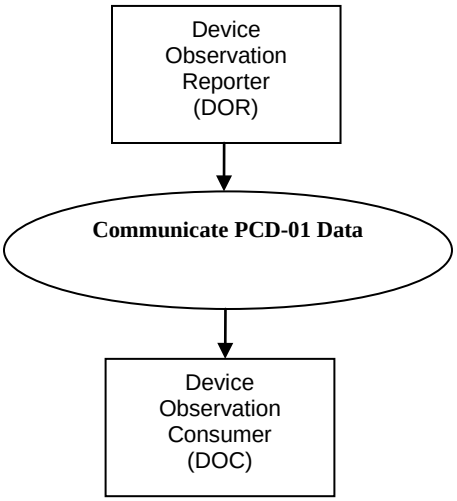


Figure 3.1.2-1: Communicate PCD Data

Actor: Device Observation Reporter (DOR)

Role: Sends PCD Data to DOC

Actor: Device Observation Consumer (DOC)

Role: Receives PCD Data from DOR.

3.1.3 Referenced Standards

- HL7 - Health Level 7 Version 2.6 Chapter 7 Observation Reporting
- ISO/IEEE 11073-10201 Domain Information Model
- ISO/IEEE 11073-10101 Nomenclature

The IHE Patient Care Device Technical Framework uses an information model and a nomenclature from the IEEE 11073. The information model is defined in ISO/IEEE 11073-10201 Health Informatics – Point-of-care medical device communication – Part 10201: Domain Information Model. The nomenclature is defined in ISO/IEEE 11073-10101 Health Informatics – Point -of-care medical device communication – Part 10101: Nomenclature. Familiarity with these standards is necessary for implementers of the Device Observation Reporter and Device Observation Consumer actors.

HL7 V2.6 Chapter 7 Observation Reporting defines the general HL7 syntax and coding requirements related to observation reporting, used for PCD data communications in the PCD TF. Familiarity with HL7 Chapter 7 is necessary for implementers of the PCD TF transactions.

This Technical Framework specifies conventions that are used to represent the information model hierarchy for medical devices embodied in the IEEE 11073 Domain Information Model within the syntactic and semantic conventions of HL7 v. 2.6

Definitions of HL7 Data Types used in PCD transactions, with comments on any specializations for PCD, are given in Appendix C, Common Data Types in this volume.

3.1.4 Interaction Diagrams

The following interaction diagrams illustrate potential implementations.

3.1.4.1 DOR communicates with DOC

The PCD-01 is used to communicate PCD data from: Device Observation Reporter (DOR) to a Device Observation Consumer (DOC).

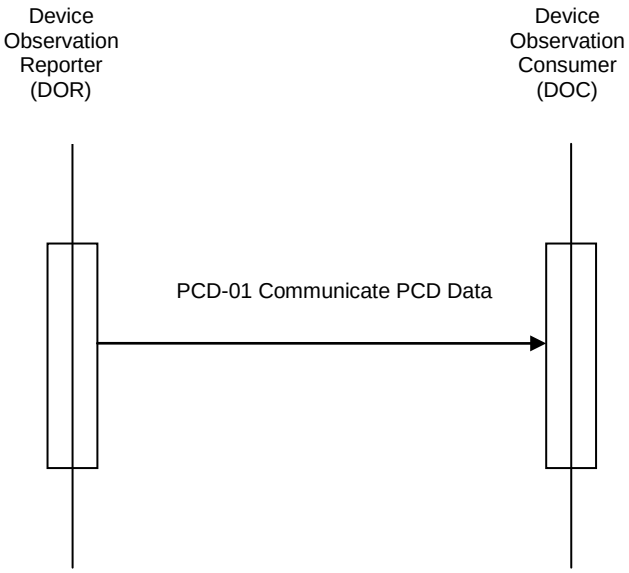


Figure 3.1.4.1-1: Communicate PCD Data Interaction Diagram

3.1.4.1.1 PCD-01 Communicate PCD Data (ORU^R01^ORU_R01) static definition

The PCD-01 Communicate PCD Data message is used to communicate PCD data

- From a Device Observation Reporter (DOR) to a Device Observation Consumer (DOC)

Common HL7 segments (MSH, MSA, ERR, NTE, PID, PV1, OBR, OBX, ORC) and data types (CWE, CNE, CX, EI, HD, PL, DTM, XPN, XTN) used in IHE PCD transactions are defined in Common Segment Descriptions, and Appendix C, "Common Data Types".

The static message is defined with the repeating segment group called "Order Observation". This group can repeat within the message so that a device needs to send only one message with multiple orders.

Table 3.1.4.1.1-1: ORU^R01^ORU_R01 static definition

Segment	Meaning	Usage	Card.	HL7 chapter
MSH	Message Header	R	[1..1]	2
[{SFT}]	Software Segment	X	[0..1]	2
[UAC]	User Authentication Credential	O		
{	--- PATIENT_RESULT begin			
[	--- PATIENT begin			
PID	Patient Identification	R	[1..1]	3
[PD1]	Additional Demographics	X	[0..0]	3
..[{NTE}]	Notes and Comments	X	[0 0]	2
..[{NK1}]	Next of Kin/Associated Parties	X	[0..0]	3

Segment	Meaning	Usage	Card.	HL7 chapter
[	--- VISIT begin			
PV1	Patient Visit	R	[1..1]	3
[PV2]	Patient Visit – Additional Info	X	[0..0]	3
]	--- VISIT end			
]	--- PATIENT end			
{	---ORDER_OBSERVATION begin			
[ORC]	Order Common	X	[0..0]	4
OBR	Observation Request	R	[1..1]	7
[{NTE}]	Notes and Comments	O	[0..1]	2
[{	--- TIMING_QTY begin			
TQ1	Timing/Quantity	R	[1..1]	4
[{TQ2}]	Timing/Quantity Order Sequence	X		4
{]	--- TIMING_QTY end			
[CTD]	Contact Data	X	[0..0]	11
[{	--- OBSERVATION begin			
OBX	Observation Result	R	[1..1]	7
[{NTE}]	Notes and comments	O	[0..1]	2
}]	--- OBSERVATION end			
[{FT1}]	Financial Transaction	X	[0..0]	6
[{CTI}]	Clinical Trial Identification	X	[0..0]	7
[{	--- SPECIMEN begin			
SPM	Specimen	X	[0..0]	7
[{OBX}]	Observation related to Specimen	X	[0..0]	7
}]	--- SPECIMEN end			
}	--- ORDER_OBSERVATION end			
}	--- PATIENT_RESULT end			
[DSC]	Continuation Pointer	X	[0..0]	2

3.1.4.1.2 Trigger events

The ORU^R01^ORU_R01 message is an unsolicited update initiated by the Device Observation Reporter. The ORU^R01 can be sent with or without a preceding order, since it is common in a clinical setting for device data to be reported without a specific order having been transacted in the information system (that is, the reporting is the result of a "standing order" for monitoring in a particular clinical situation).

While a DOR actor may be implemented directly on a medical device, it is more often implemented on a gateway or intermediary device as an application which implements the DOR, receiving data from one or more patient care devices using either standards-based or proprietary protocols which are outside the current scope of the IHE PCD TF.

In general, the DOR sends periodic reports at an interval of between several times per minute (high acuity) and a maximum interval of 24 hours (chronic, home health) with a typical interval of 1 minute. The minimum and maximum intervals are configured at implementation. The DOR may also send aperiodic reports for "event type" information. The DOR shall not do interpolation of data received from the PCD source.

3.1.4.1.3 Message Semantics

Refer to the HL7 standard for the ORU message of HL7 2.6 Chapter 7 and the general message semantics.

The ORU^OR1^ORU_R01 message structure provides the mechanisms for mapping the hierarchical structure of an IEEE 11073 containment tree to a series of OBX messages each of which is optionally qualified by a note which immediately follows the respective OBX. See the discussion of how the containment is represented using a "dotted notation" in field OBX-4 Observation Sub-ID in Appendix B, Section B.8 .

See 3.3 ISO/IEEE Nomenclature mapping to HL7 OBX-3 for further information on the mapping rules.

Examples of ORU^R01^ORU_R01 messages implemented in HL7 ER are provided in Appendix E.

3.1.4.1.4 Expected Actions

The ORU^R01^ORU_R01 message is sent from the DOR to the DOC. Upon receipt the DOC validates the message and responds with an acknowledgement as defined in Appendix G.1.1 Acknowledgment Modes.

3.1.5 Security Considerations

During the Profile development there were no unusual security or privacy concerns identified. There are no mandatory security controls but the implementer is encouraged to use the underlying security and privacy profiles from ITI that are appropriate to the transports such as the Audit Trail and Node Authentication (ATNA) profile. The operational environment risk assessment, following ISO 80001, will determine the actual security and safety controls employed.

3.2 PCD-02 Reserved

3.3 PCD-03 Communicate Infusion Order

This section specifies Transaction PCD-03 of the IHE Patient Care Device Technical Framework. Transaction PCD-03 is used by the Infusion Order Programmer and Infusion Order Consumer.

Since the IOC is typically a gateway rather than an infusion pump, all of the information specified in the PCD-03 Communicate Infusion Order transaction is not necessarily provided to or used to program the device.

Note: see related detail on infusion pump device models and data models in the Device Specialization – Infusion Pump PCD profiles for large volume pumps, syringe pumps and patient controlled analgesia.

3.3.1 Scope

This transaction is used to communicate Infusion Order parameters from an Infusion Order Programmer (IOP) to an Infusion Order Consumer (IOC).

3.3.2 Use Case Roles

Actor: Infusion Order Programmer

Role: Sends Infusion Order parameters to IOC

Actor: Infusion Order Consumer

Role: Receives Infusion Order parameters from IOP and in turn programs the pump

3.3.3 Referenced Standard

- HL7 - Health Level 7 Version 2.6 Ch4 Order Entry
- ISO/IEEE 11073-10101 Nomenclature

3.3.4 Interaction Diagram

The following interaction diagram illustrates the implementation.

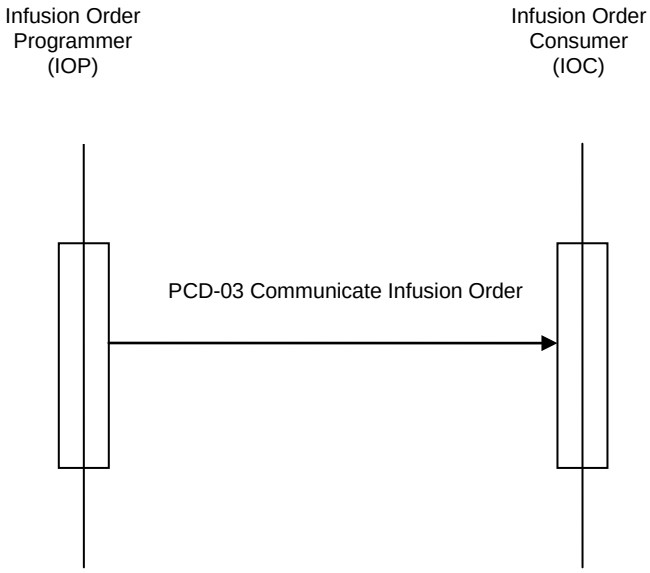


Figure 3.3.4-1: Communicate Infusion Order

3.3.4.1 PCD-03 Communicate Infusion Order (RGV^O15^RGV_O15) static definition

The PCD-03 Communicate Infusion Order message is used to communicate infusion data from an Infusion Order Programmer (IOP) to an Infusion Order Consumer (IOC).

Since the IOC is typically a gateway rather than an infusion pump, all of the information specified in the PCD-03 Communicate Infusion Order transaction is not necessarily provided to or used to program the device.

All HL7 segments used in the PCD-03 transaction are defined within this document.

3.3.4.2 RGV^O15^RGV_O15 Pharmacy/Treatment Give Message

Table 3.3.4.2-1: RGV^O15^RGV_O15 Pharmacy/Treatment Give Message

Segment	Meaning	Usage	Card	HL7 Chapter
MSH	Message Header	R	[1..1]	2
[{ SFT }]	Software	X		2
[{ NTE }]	Notes and Comments (for Header)	X		2
[	--- PATIENT begin			
PID	Patient Identification	R	[1..1]	3
[{ NTE }]	Notes and Comments (for PID)	X		2

Segment	Meaning	Usage	Card	HL7 Chapter
[{ AL1 }]	Allergy Information	X		2
[	--- PATIENT_VISIT begin			
PV1	Patient Visit	O	[0..1]	3
[PV2]	Patient Visit – Additional Info	X		3
]	--- PATIENT_VISIT end			
]	--- PATIENT end			
{	--- ORDER begin			
ORC	Common Order	R	[1..1]	4
[{	--- TIMING begin			
TQ1	Timing/Quantity	X		4
[{ TQ2 }]	Timing/Quantity Order Sequence	X		4
}]	--- TIMING end			
[	--- ORDER_DETAIL begin			
RXO	Pharmacy /Treatment Order	X		4
[	--- ORDER_DETAIL_SUPPLEMENT begin			
{ NTE }	Notes and Comments (for RXO)	X		2
{ RXR }	Pharmacy/Treatment Route	X		4
[{	--- COMPONENTS begin			
RXC	Pharmacy/Treatment Component	X		4
[{ NTE }]	Notes and Comments (for each RXC)	X		2
}]	--- COMPONENTS end			
]	--- ORDER_DETAIL_SUPPLEMENT end			
]	--- ORDER_DETAIL end			
[	--- ENCODING begin			
RXE	Pharmacy/Treatment Encoded Order	X		4
{	--- TIMING_ENCODED begin			
TQ1	Timing/Quantity	X		4
[{ TQ2 }]	Timing/Quantity Order Sequence	X		4
}	--- TIMING_ENCODED end			
{ RXR }	Pharmacy/Treatment Route	X		4
[{ RXC }]	Pharmacy/Treatment Component	X		4
]	--- ENCODING end			
{	--- GIVE begin			
RXG	Pharmacy/Treatment Give	R	[1..1]	4
{	--- TIMING_GIVE begin			
TQ1	Timing/Quantity	O	[0..1]	4
[{ TQ2 }]	Timing/Quantity Order Sequence	X		4
}	--- TIMING_GIVE end			
{ RXR }	Pharmacy/Treatment Route	R	[1..1]	4
[{ RXC }]	Pharmacy/Treatment Component	X		4

Segment	Meaning	Usage	Card	HL7 Chapter
{	--- OBSERVATION begin			
[OBX]	Observation/Results	R	[1..4]	7
[{ NTE }]	Notes and Comments (for OBX)	X		2
}	--- OBSERVATION end			
}	--- GIVE end			
}	--- ORDER end			

3.3.4.3 Trigger Events

The RGV^O15^RGV_O15 message is generated by the Infusion Order Programmer when the caregiver initiates an action to administer a medication using an IV pump.

3.3.4.4 Message Semantics

Refer to the HL7 standard for the RGV message in HL7 2.6 Chapter 4 for the general message semantics.

3.3.4.4.1 MSH – Message Header Segment

This segment defines the intent, source, destination, and some specifics of the syntax of a message. See HL7 v2.6: chapter 2 Message control. For MSH usage in IHE PCD Technical Framework profiles, refer to Appendix B.1 of this volume. MSH-15 and MSH-16 fields have special considerations in PCD 03:

MSH-15 Accept Acknowledgement Type (ID), required:

This is required for all messages. The Accept Acknowledg**e**ment Type field will be valued with "AL" (always) by the IOP in a RGV^O15 message and by the IOC in a RRG^O16 message.

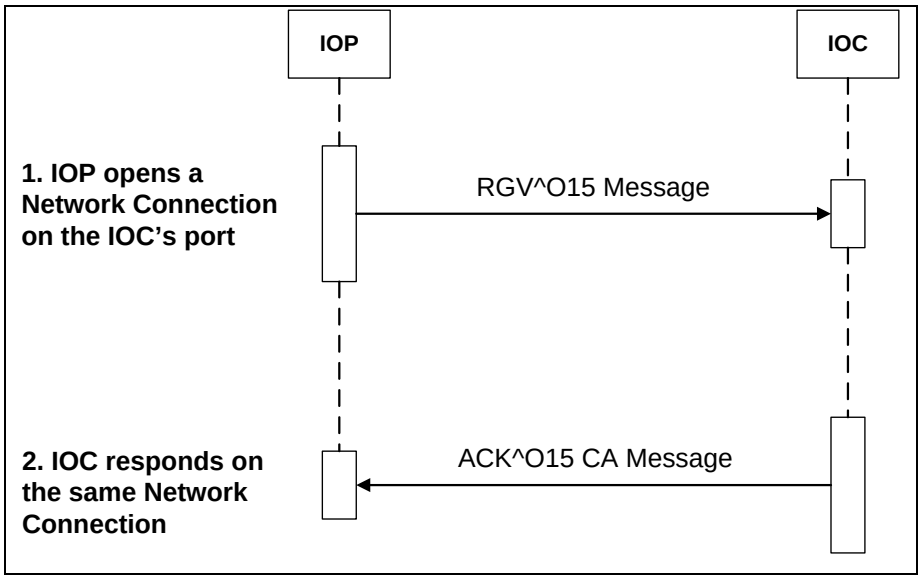
The receiving application must transmit the accept acknowledgement on the same network connection as the initiating RGV^015 or RRG^O16 message. The receiving system must send (or not send) acknowledgements as specified by this field.

MSH-16 Application Acknowledgement Type (ID), required:

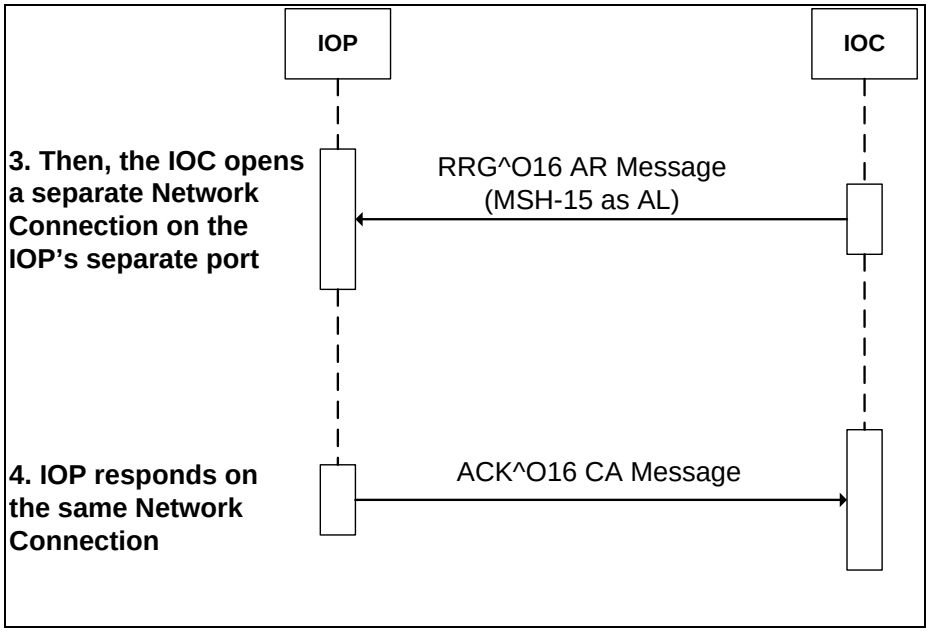
This is required for all messages. The application acknowledgement field informs the receiver whether the sender can process application acknowledgements and under what conditions to send the additional acknowledgement. The receiving system must send (or not send) acknowledgements as specified by this field.

When the sending application requests an application acknowledgement, the receiving application must initiate a new network connection for the transaction. Here is an example of an IOP to IOC transaction:

1. The IOP sends a RGV^O15 message on the IOC's port 3000 with MSH-15="AL" and MSH-16="AL".
2. The IOC receives the message on port 3000 and transmits an ACK^O15 to the IOP on the same network connection.



3. After completing application processing, the IOC transmits a RRG^016 on a different network connection (e.g., the IOP's port 3001) with MSH-15="AL" and MSH-16="NE".
4. The IOP receives the message on port 3001 and sends an ACK^016 to the IOC on the same network connection.



After completing application processing, the IOP does not transmit an application acknowledgement.

If the IOP wants to always receive an application acknowledgement (RRG) message in addition to the accept acknowledgement, the IOP must populate MSH-16 with “AL” (always). If the IOP cannot process application acknowledgement messages, the IOP must populate MSH-16 with “NE” (never). The IOP must populate MSH-16 with “ER” (error) when the system only wants to receive an application acknowledgement message when the IOC detects an error.

The table below identifies the possible values for MSH-16:

Table 3.3.4.4.1-1: Possible Values for MSH-16 in PCD-03 Message

Value	Description	Comments
AL	Always	The sender always wants to receive an application acknowledgement in addition to the accept acknowledgement.
NE	Never	The sender cannot process application acknowledgements
ER	Error/reject	The sender only wants to be notified if there is a message error detected

This profile recommends “AL” (always) to receive complete messaging processing confirmation. If this support is not feasible, this profile recommends that the IOP value the application acknowledgement field with “ER” (error/reject), so that the IOC will only send an application error when it is unable to process the requested order.

This profile recommends that the IOC value the application acknowledgement field with “NE” on a RRG^O16, so that the IOP will only send an accept acknowledgement and not an application acknowledgement. Note that the IOP is responsible for sending (or not sending) an acknowledgement as specified by the IOC.

3.3.4.4.2 PID - Patient Identification Segment

The PID segment is used by all applications as the primary means of communicating patient identification information. This segment contains permanent patient identifying and demographic information that, for the most part, is not likely to change frequently. See HL7 v2.6 : chapter 3 (3.4.2). For PID usage in IHE PCD Technical Framework profiles, refer to Appendix B.5 of this volume.

3.3.4.4.3 PV1 Patient Visit Segment

The PV1 segment is used by Registration/Patient Administration applications to communicate information on an account or visit-specific basis. See Appendix B.6 for details.

3.3.4.4.4 ORC - Common Order Segment

The Common Order segment (ORC) is used to transmit fields that are common to all orders (all types of services that are requested). See Appendix B.9 for details of usage in IHE PCD profiles.

3.3.4.4.5 RXG - Pharmacy/Treatment Give Segment

Table 3.3.4.4.5-1: HL7 Attribute Table – RXG – Pharmacy/Treatment Give

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM #	ELEMENT NAME
1	4	NM	R	[1..1]		00342	Give Sub-ID Counter
2	4	NM	RE	[0..1]		00334	Dispense Sub-ID Counter
3	705	TQ	X	[0..0]		00221	Quantity/Timing
4	705	CWE	R	[1..1]	0292	00317	Give Code
5	20	NM	R	[1..1]		00318	Give Amount - Minimum
6	20	NM	RE	[0..1]		00319	Give Amount - Maximum
7	705	CWE	R	[1..1]		00320	Give Units
8	705	CWE	RE	[0..1]		00321	Give Dosage Form
9	705	CWE	RE	[0..*]		00351	Administration Notes
10	1	ID	RE	[0..1]	0167	00322	Substitution Status
11	200	LA2	RE	[0..1]		01303	Dispense-To Location
12	1	ID	RE	[0..1]	0136	00307	Needs Human Review
13	705	CWE	RE	[0..*]		00343	Pharmacy/Treatment Supplier's Special Administration Instructions
14	20	ST	RE	[0..1]		00331	Give Per (Time Unit)
15	6	ST	R	[1..1]		00332	Give Rate Amount
16	705	CWE	R	[1..1]		00333	Give Rate Units
17	20	NM	RE	[0..1]		01126	Give Strength
18	705	CWE	RE	[0..1]		01127	Give Strength Units
19	20	ST	RE	[0..*]		01129	Substance Lot Number
20	24	DTM	RE	[0..*]		01130	Substance Expiration Date
21	705	CWE	RE	[0..*]	0227	01131	Substance Manufacturer Name
22	705	CWE	RE	[0..*]		01123	Indication
23	5	NM	RE	[0..1]		01692	Give Drug Strength Volume
24	705	CWE	RE	[0..1]		01693	Give Drug Strength Volume Units
25	60	CWE	RE	[0..1]		01694	Give Barcode Identifier
26	1	ID	RE	[0..1]	0480	01695	Pharmacy Order Type
27	705	CWE	X	[0..0]		01688	Dispense to Pharmacy
28	106	XAD	X	[0..0]		01689	Dispense to Pharmacy Address
29	80	PL	X	[0..0]		01683	Deliver-to Patient Location
30	250	XAD	X	[0..0]		01684	Deliver-to Address

The following describes the IHE PCD usage of those fields which have a usage other than X in the above table.

RXG-1 Give Sub-ID Counter

Definition: This field must contain a unique number for the placer order number. This field along with the placer order number provides a unique reference to the specific administration of the order.

Typically this number would be assigned by the system responsible for medication administration scheduling.

RXG-2 Dispense Sub-ID Counter

See HL7 V2.6 Section 4.14.6.2 for details. The PCD TF does not further constrain this field.

RXG-4 Give Code

```
Components: <Identifier (ST)> ^ <Text (ST)> ^ <Name of Coding System (ID)> ^
            <Alternate Identifier (ST)> ^ <Alternate Text (ST)> ^ <Name of Alternate
            Coding System (ID)> ^ <Coding System Version ID (ST)> ^ <Alternate Coding
            System Version ID (ST)> ^ <Original Text (ST)>
```

Definition: This field is the identifier of the primary additive or principal ingredient of the IV medication to be administered to the patient.

Subfields CWE-1 "Identifier" and CWE-2 "Text" are required for each identifier. Typically "Identifier" would be populated with a value such as an NDC or another value known to both the Infusion Order Programmer and the Infusion Order Consumer. "Text" would typically be populated with the generic name of the medication. The information provided in either Identifier or Text is used to match the ordered medication to the onboard drug library.

RXG-5 Give Amount – Minimum

Definition: This field contains the volume of fluid to be administered (VTBI). This volume is the actual fluid volume that the clinician intends to administer (not necessarily the volume of the bag).

RXG-6 Give Amount - Maximum

See HL7 V2.6 Section 4.14.6.6 for details. The PCD TF does not further constrain this field.

RXG-7 Give Units

```
Components: <Identifier (ST)> ^ <Text (ST)> ^ <Name of Coding System (ID)> ^
            <Alternate Identifier (ST)> ^ <Alternate Text (ST)> ^ <Name of Alternate
            Coding System (ID)> ^ <Coding System Version ID (ST)> ^ <Alternate Coding
            System Version ID (ST)> ^ <Original Text (ST)>
```

Definition: This field contains the coded units for the Give Amount. The preferred format is an MDC value; UCUM values are also acceptable.

The PCD TF requires that the first three components of RXG-7 contain one of the following sets of values:

- `263762^MDC_DIM_MILLI_L^MDC`
- `mL^mL^UCUM`

RXG-8 Give Dosage Form

See HL7 V2.6 Section 4.14.6.8 for details. The PCD TF does not further constrain this field.

RXG-9 Administration Notes

See HL7 V2.6 Section 4.14.6.9 for details. The PCD TF does not further constrain this field.

RXG-10 Substitution Status

See HL7 V2.6 Section 4.14.6.10 for details. The PCD TF does not further constrain this field.

RXG-11 Dispense-to Location

See HL7 V2.6 Section 4.14.6.11 for details. The PCD TF does not further constrain this field.

RXG-12 Needs Human Review

See HL7 V2.6 Section 4.14.6.12 for details. The PCD TF does not further constrain this field.

RXG-13 Pharmacy/Treatment Supplier's Special Administration Instructions

See HL7 V2.6 Section 4.14.6.13 for details. The PCD TF does not further constrain this field.

RXG-14 Give Per (Time Unit)

See HL7 V2.6 Section 4.14.6.14 for details. The PCD TF does not further constrain this field.

RXG-15 Give Rate Amount

Definition: This field contains the numeric portion of the rate or dose to be administered. If the infusion requires a dosed value, such as dopamine at 5 mcg/kg/min, this field contains the dose value amount (e.g., “5"). If it does not, such as normal saline at 75 mL/hr, then this field contains the rate value (e.g., "75").

RXG-16 Give Rate Units

```
Components: <Identifier (ST)> ^ <Text (ST)> ^ <Name of Coding System (ID)> ^
            <Alternate Identifier (ST)> ^ <Alternate Text (ST)> ^ <Name of Alternate
            Coding System (ID)> ^ <Coding System Version ID (ST)> ^ <Alternate Coding
            System Version ID (ST)> ^ <Original Text (ST)>
```

Definition: This field contains the coded version of the units portion of the rate or dose to be administered. If the infusion requires a dosed value, such as dopamine at 5 mcg/kg/min, this field represents the dose units (e.g., "mcg/kg/min"). If it does not, such as normal saline at 75 mL/hr, then this field represents the rate units (e.g., "mL/hr"). The preferred format is an MDC value; UCUM values are also acceptable.

Examples:

```
265266^MDC_DIM_MILLI_L_PER_HR^MDC
265619^MDC_DIM_MICRO_G_PER_KG_PER_MIN^MDC
ml/h^ml/h^UCUM
ug/kg/min^ug/kg/min^UCUM
```

RXG-17 Give Strength

Definition: This field contains the quantity of the main ingredient in the infusion; e.g., for dopamine 800 mg in 250 mL D5W, the field would contain the value "800".

RXG-18 Give Strength Units

```
Components: <Identifier (ST)> ^ <Text (ST)> ^ <Name of Coding System (ID)> ^
            <Alternate Identifier (ST)> ^ <Alternate Text (ST)> ^ <Name of Alternate
            Coding System (ID)> ^ <Coding System Version ID (ST)> ^ <Alternate Coding
            System Version ID (ST)> ^ <Original Text (ST)>
```

This field contains the coded version of the units portion of the main ingredient in the infusion; e.g., for dopamine 800 mg in 250 mL D5W, the field would represent ‘mg". The preferred format is an MDC value; UCUM values are also acceptable:

Examples:

```
263890^MDC_DIM_MILLI_G^MDC
mg^mg^UCUM
```


RXG-19 Substance Lot Number

See HL7 V2.6 Section 4.14.6.19 for details. The PCD TF does not further constrain this field.

RXG-20 Substance Expiration Date

See HL7 V2.6 Section 4.14.6.20 for details. The PCD TF does not further constrain this field.

RXG-21 Substance Manufacturer Name

See HL7 V2.6 Section 4.14.6.21 for details. The PCD TF does not further constrain this field.

RXG-22 Indication

See HL7 V2.6 Section 4.14.6.22 for details. The PCD TF does not further constrain this field.

RXG-23 Give Drug Strength Volume

Definition: This field contains the quantity of the diluent or base fluid ingredient(s) in the infusion; e.g., for dopamine 800 mg in 250 mL D5W, the field would contain the value "250".

RXG-24 Give Drug Strength Volume Units

```
Components: <Identifier (ST)> ^ <Text (ST)> ^ <Name of Coding System (ID)> ^
            <Alternate Identifier (ST)> ^ <Alternate Text (ST)> ^ <Name of Alternate
            Coding System (ID)> ^ <Coding System Version ID (ST)> ^ <Alternate Coding
            System Version ID (ST)> ^ <Original Text (ST)>
```

Definition: This field contains the coded units for the Give Drug Strength Volume. The preferred format is an MDC value; UCUM values are also acceptable.

The PCD TF requires that the first three components of RXG-24 contain one of the following sets of values:

- `263762^MDC_DIM_MILLI_L^MDC`
- `mL^mL^UCUM`

RXG-25 Give Barcode Identifier

See HL7 V2.6 Section 4.14.6.25 for details. The PCD TF does not further constrain this field.

RXG-26 Pharmacy Order Type

See HL7 V2.6 Section 4.14.6.26 for details. The PCD TF does not further constrain this field.

RXG-27 to 30

These fields are not supported by the PCD TF.

3.3.4.4.6 TQ1 Timing Quantity Segment

This segment is an optional segment which allows the IOP to specify the duration of the infusion order. Along with the ordered dose (RXG.18) the infuser can then calculate the rate at which the infusion should be run. Not all IOCs will be able to support duration based infusions even vendors that do support will have limits on the types of infusions which support duration see each vendors implementation guide for further details.

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM #	ELEMENT NAME
1	4	SI	O	[0..1]		01627	Set ID - TQ1
2	20	CQ	X	[0..0]		01628	Quantity
3	540	RPT	X	[0..0]	0335	01629	Repeat Pattern
4	20	TM	X	[0..0]		01630	Explicit Time
5	20	CQ	X	[0..0]		01631	Relative Time and Units
6	20	CQ	X	[0..0]		01632	Service Duration
7	26	TS	X	[0..0]		01633	Start date/time
8	26	TS	X	[0..0]		01634	End date/time
9	705	CWE	X	[0..0]	0485	01635	Priority
10	250	TX	X	[0..0]		01636	Condition text
11	250	TX	X	[0..0]		01637	Text instruction
12	10	ID	X	[0..0]	0427	01638	Conjunction
13	20	CQ	R	[1..3]		01639	Occurrence duration
14	10	NM	X	[0..1]		01640	Total occurrence's

TQ1-1 Set ID

See HL7 v2.6 Section 4.5.4.1 for details. The PCD TF does not further constrain this field.

TQ1-2 Quantity

See HL7 v2.6 Section 4.5.4.2 for details. The PCD TF does not further constrain this field.

TQ1-3 Repeat Pattern

See HL7 v2.6 Section 4.5.4.3 for details. The PCD TF does not further constrain this field.

TQ1-4 Explicit Time

See HL7 v2.6 Section 4.5.4.4 for details. The PCD TF does not further constrain this field.

TQ1-5 Relative Time and Units

See HL7 v2.6 Section 4.5.4.5 for details. The PCD TF does not further constrain this field.

TQ1-6 Service Duration

See HL7 v2.6 Section 4.5.4.6 for details. The PCD TF does not further constrain this field.

TQ1-7 Start date/time

See HL7 v2.6 Section 4.5.4.7 for details. The PCD TF does not further constrain this field.

TQ1-8 End date/time

See HL7 v2.6 Section 4.5.4.8 for details. The PCD TF does not further constrain this field.

TQ1-9 Priority

See HL7 v2.6 Section 4.5.4.9 for details. The PCD TF does not further constrain this field.

TQ1-10 Condition text

See HL7 v2.6 Section 4.5.4.10 for details. The PCD TF does not further constrain this field.

TQ1-11 Text instruction

See HL7 v2.6 Section 4.5.4.11 for details. The PCD TF does not further constrain this field.

TQ1-12 Conjunction

See HL7 v2.6 Section 4.5.4.12 for details. The PCD TF does not further constrain this field.

TQ1-13 Occurrence duration

Components: <Quantity (NM)> ^ <Units (CE)>

Subcomponents for Units (CE): <Identifier (ST)> & <Text (ST)> & <Name of Coding System (ID)> & <Alternate Identifier (ST)> & <Alternate Text (ST)> & <Name of Alternate Coding System (ID)>

This field specifies the duration of the infusion, along with the dose or the volume to be administered the rate can be calculated by the infuser.

The only acceptable time values for this field are seconds, minutes, and hours. To specify multiple components of time this field can be repeated two additional times.

Unit of Time	MDC Code
Hour	2240&MDC_DIM_HR&MDC
Minute	2208&MDC_DIM_MIN&MDC
Second	2176&MDC_DIM_SEC&MDC

Examples:

90 Seconds:
90^2176&MDC_DIM_SEC&MDC

2 Hours 45 Minutes:
2^2240&MDC_DIM_HR&MDC~45^2208&MDC_DIM_MIN&MDC

TQ1-14 Total occurrence's

See HL7 v2.6 Section 4.5.4.14 for details. The PCD TF does not further constrain this field.

3.3.4.4.7 Usage notes for RXG 17, 18, 23, and 24

These fields are used by the pump or gateway to determine the concentration of the main ingredient in the infusion. Concentration is defined as:

[Medication amount][units] / [Diluent amount][units]

Example: 800 mg / 250 mL

The pump's onboard drug library may require this information in order to apply dosing limits to ensure the safe administration of a particular infusion. The "rules" contained in the drug library may be different for different concentrations of the same drug. For example, there may be two different rules for the medication "dopamine"; one specific for dopamine 800 mg in 250 mL, and another for any other concentration.

The BCMA system cannot know when the information is required since the drug library definition is internal to the pump system. BCMA systems may extract the information needed from the underlying order, from their formulary, or both. Basically, if the BCMA is able to determine these values, they should be supplied in the PCD-03 transaction.

An analogy to a pharmacy order for an IV fluid containing multiple components (RXC segments) may be helpful in determining how to populate these values. In PCD-03, RXG-17 and 18 (Give Strength/Units) are analogous to the Component Strength and Units (RXC-5 and 6) for the additive component (i.e., RXC-1 = "A"). Similarly, RXG-23 and 24 (Give Drug Strength Volume/Units) are similar to Component Drug Strength Volume and Units (RXC-8 and 9) for the base component (RXC-1 = "B").

Example:

Ampicillin 1 g/Sodium chloride 50 mL

RXC segments for Ampicillin (pharmacy order message):

Component	RXC-1	RXC-5	RXC-6	RXC-8	RXC-9
Ampicillin	A	1	G		
Sodium chloride	B			50	ML

RXG segment population for Ampicillin:

RXG-17	RXG-18	RXG-23	RXG-24
1	263872^MDC_DIM_G^MDC	50	263762^MDC_DIM_MILLI_L^MDC

Premixed medication orders

Certain marketed medication products are "premixed", containing both the additive and the base mixed together and sold as a single item.

Examples:

Dopamine 800 mg / Dextrose 5% 250 mL

Cefazolin 1 g / Dextrose 5% 50 mL

RXG segment population for Dopamine:

RXG-17	RXG-18	RXG-23	RXG-24
800	263890^MDC_DIM_MILLI_G^MDC	250	263762^MDC_DIM_MILLI_L^MDC

Fluid orders

"Plain" IV fluids do not contain an additive. The BCMA is not required to populate RXG-17, 18, 23, and 24 for these orders.

Examples:

Dextrose 5% 1000 mL

Sodium Chloride 0.9% 250 mL

Orders with multiple additives

Some infusion orders may contain multiple additives, for example, total parenteral nutrition (TPN) solutions are made up of one or more base solutions and as many as 10 or 12 additives. The BCMA is not required to populate RXG-17, 18, 23, and 24 for these orders.

3.3.4.4.8 RXR - Pharmacy/Treatment Route Segment

The Pharmacy/Treatment Route segment contains the alternative combination of route, site, administration device, and administration method that are prescribed.

Table 3.3.4.4.7-1: HL7 Attribute Table – RXR – Pharmacy/Treatment Route

SEQ	LEN	DT	Usage	Card.	TBL#	ITEM #	ELEMENT NAME
1	705	CWE	R	[1..1]	0162	00309	Route
2	705	CWE	RE	[0..1]	0550	00310	Administration Site
3	705	CWE	RE	[0..1]	0164	00311	Administration Device
4	705	CWE	R	[1..1]	0165	00312	Administration Method
5	705	CWE	RE	[0..1]		01315	Routing Instruction
6	705	CWE	RE	[0..1]	0495	01670	Administration Site Modifier

The following describes the IHE PCD usage of the fields in the above table.

RXR-1 Route

```
Components: <Identifier (ST)> ^ <Text (ST)> ^ <Name of Coding System (ID)> ^
            <Alternate Identifier (ST)> ^ <Alternate Text (ST)> ^ <Name of Alternate
            Coding System (ID)> ^ <Coding System Version ID (ST)> ^ <Alternate Coding
            System Version ID (ST)> ^ <Original Text (ST)>
```

Definition: This field is the route of administration. The PCD TF requires that this field be valued as ^IV^HL70162.

RXR-2 Administration Site

See HL7 V2.6 Section 4.14.2.2 for details. The PCD TF does not further constrain this field.

RXR-3 Administration Device

```
Components: <Identifier (ST)> ^ <Text (ST)> ^ <Name of Coding System (ID)> ^
            <Alternate Identifier (ST)> ^ <Alternate Text (ST)> ^ <Name of Alternate
            Coding System (ID)> ^ <Coding System Version ID (ST)> ^ <Alternate Coding
            System Version ID (ST)> ^ <Original Text (ST)>
```

Definition: This field contains the type of pump used to administer the drug, if known by the BCMA system. The PCD TF requires that this field be valued as ^IVP^HL70164 for general infusion devices or ^SYR^HL70164 for syringe pump devices, if the type of pump is known.

The following entry should be added to user-defined table #0164:

Value	Description
SYR	Syringe Pump

RXR-4 Administration Method

```
Components: <Identifier (ST)> ^ <Text (ST)> ^ <Name of Coding System (ID)> ^
            <Alternate Identifier (ST)> ^ <Alternate Text (ST)> ^ <Name of Alternate
            Coding System (ID)> ^ <Coding System Version ID (ST)> ^ <Alternate Coding
            System Version ID (ST)> ^ <Original Text (ST)>
```

Definition: This field identifies whether the infusion is to be administered as a primary infusion or as an IV piggyback or secondary infusion. The TF requires that this field be valued as ^IV^HL70165 for a primary infusion or ^IVPB^HL70165 for an IV piggyback or secondary infusion.

The following entry should be added to user-defined table #0165:

Value	Description
IV	IV Primary

RXR-5 Routing Instruction

See HL7 V2.6 Section 4.14.2.5 for details. The PCD TF does not further constrain this field.

RXR-6 Administration Site Modifier

See HL7 V2.6 Section 4.14.2.6 for details. The PCD TF does not further constrain this field.

3.3.4.4.9 OBX - Observation/Result segment

Refer to HL7 v2.6: Section 7.4.2

The HL7 OBX segment is used to transmit a single observation or observation fragment. In the Point-of-Care Infusion Verification Profile the usage is limited to (1) providing the Device ID that will be used by the Infusion Order Consumer and (2) providing patient height, weight, or Body Surface Area (BSA) information from the Infusion Order Programmer to the Infusion Order Consumer. Note that the definition of the OBX segment in this profile is constrained from the definition used in the PCD Observation/Result Message to reflect this limited usage. The broader definition can be found in OBX - Observation/Result segment, Appendix Section B-8.

One OBX segment containing the Device ID must always be present. One to three additional OBX segments containing the patient height and/or patient weight and/or patient BSA may optionally follow.

Table 3.3.4.4.8-1: OBX segment

SEQ	LEN	DT	Usage	Card.	TBL#	Element name
1	4	SI	R	[1..1]		Set ID – OBX
2	3	ID	CE	[0..1]	0125	Value Type
3	705	CWE	R	[1..1]		Observation Identifier
4	20	ST	RE	[1..1]		Observation Sub-ID
5	99999	Varies	CE	[0..1]		Observation Value
6	705	CWE	CE	[0..1]		Units
7	60	ST	RE	[0..1]		References Range
8	5	IS	RE	[0..1]	0078	Abnormal Flags
9	5	NM	X	[0..0]		Probability
10	2	ID	RE	[0..1]	0080	Nature of Abnormal Test
11	1	ID	RE	[1..1]	0085	Observation Result Status
12	24	DTM	X	[0..0]		Effective Date of Reference Range
13	20	ST	X	[0..0]		User Defined Access Checks
14	24	DTM	RE	[0..1]		Date/Time of the Observation
15	705	CWE	RE	[0..1]		Producer's ID
16	3220	XCN	RE	[0..1]		Responsible Observer
17	705	CWE	RE	[0..1]		Observation Method
18	427	EI	CE	[0..1]		Equipment Instance Identifier
19	24	DTM	RE	[0..1]		Date/Time of the Analysis
20	705	CWE	RE	[0..*]	0163	Observation Site

The following describes the IHE PCD PIV profile's usage of those fields which have a usage other than X in the above table.

OBX-1 Set ID

This field contains the sequence number of the OBX in this message; i.e., 1st OBX Set ID = 1, 2nd OBX set_ID = 2, etc., regardless of whether the OBX refers to a device or a metric value.

OBX-2 Value Type

The PCD PIV profile restricts this value to NM if OBX-3 refers to weight or height, or empty if OBX-3 refers to a pump ID.

OBX-3 Observation Identifier

The PCD PIV profile constrains the value of this field to one of the following:

```
68063^MDC_ATTR_PT_WEIGHT^MDC
68060^MDC_ATTR_PT_HEIGHT^MDC
69986^MDC_DEV_PUMP_INFUS_VMD^MDC
57672^MDC_AREA_BODY_SURF_ACTUAL^MDC
```

OBX-4 Observation Sub-ID

The PC PIV profile does not further constrain this field.

OBX-5 Observation Value

If OBX-3 refers to weight or height, then this field contains the weight or height value, respectively. If OBX-3 refers to the pump ID, this field must be empty.

OBX-6 Units

The PCD PIV profile constrains the value of this field based on the value in OBX-3.

If OBX-3 refers to weight, this field contains the coded units for the weight. The preferred format is an MDC value; UCUM values are also acceptable. When OBX-3 refers to weight, the first three components of OBX-6 must contain one of the following sets of values:

```
263872^MDC_DIM_G^MDC
263875^MDC_DIM_KILO_G^MDC
g^g^UCUM
kg^kg^UCUM
```

If OBX-3 refers to height, this field contains the coded units for the height. The preferred format is an MDC value; UCUM values are also acceptable. When OBX-3 refers to height, the first three components of OBX-6 must contain one of the following sets of values:

```
263441^MDC_DIM_CENTI_M^MDC
cm^cm^UCUM
```

If OBX-3 refers to a pump ID, this field must be empty.

OBX-7 References Range:

The PCD PIV profile does not further constrain this field.

OBX-8 Abnormal Flags

The PCD PIV profile does not further constrain this field.

OBX-10 Nature of Abnormal Test

The PCD PIV profile does not further constrain this field.

OBX-11 Observation Result Status

The PCD PIV profile does not further constrain this field.

OBX-14 Date/Time of the Observation

The PCD PIV profile does not further constrain this field.

OBX-15 Producer's ID

The PCD PIV profile does not further constrain this field.

OBX-16 Responsible Observer (XCN)

The PCD PIV profile does not further constrain this field.

OBX-17 Observation Method

The PCD PIV profile does not further constrain this field.

OBX-18 Equipment Instance Identifier

See Appendix Section B.8 for description of usage of OBX-18.

For backward compatibility, the OBX-18 convention used in previous Trial Implementation versions of the Point-of-Care Infusion Verification Supplement may be used by agreement between sending and receiving systems, but this usage is deprecated and should not be used in new systems. The former language is reproduced here: "If OBX-3 refers to the pump ID, the ID is placed in the 'Universal ID' component (EI-3), and the device or manufacturer name is placed in the 'Universal ID Type' component (EI-4). The pump ID is a unique alphanumeric identifier and may optionally include the pump channel. The format of the identifier is vendor-specific. A typical value could be a serial number for a single-channel pump, or a serial number followed by the channel number or letter for a multi-channel pump. Note that this specification differs from the usage of OBX-18 in IHE PCD DEC profiles."

New applications should conform to the general specification for OBX-18 (Appendix section B.8). The pump ID (vendor-specific format, which may optionally include the pump channel as before) should be placed in EI-1, and EI-3 and EI-4 should identify the manufacturer of the pump according to an accepted Universal ID system.

If OBX-3 refers to weight or height, this field must be empty.

OBX-19 Date/Time of the Analysis

The PCD PIV profile does not further constrain this field.

OBX-20 Observation Site

The PCD PIV profile does not further constrain this field.

OBX-21 to 25

OBX fields 21 to 25 are not supported by PCD PIV.

3.3.4.4.10 Expected Actions

The Pharmacy/Treatment Give Message (RGV^O15^RGV_O15) is sent from the Infusion Order Programmer to the Infusion Order Consumer.

The receiving system validates the message and responds with an accept acknowledgment message (ACK^O15^ACK). If an error condition is detected and if MSH-16 (Application Acknowledgement Type) in the RGV^O15^RGV_O15 message is valued as "ER" or "AL", the

IOC responds with a Pharmacy/Treatment Give Acknowledgment Message (RRG^O16^RRG_O16).

If the message is accepted by the IOC, the accept acknowledgment will contain the value CA in MSA-1. If not, the accept acknowledgment will contain either CR or CE, based upon HL7 enhanced acknowledgment rules (see HL7 v2.6, Section 2.9.3.2).

Message acceptance is based on:

• All required segments and fields are present

• No incorrect data types are present. Validation of fields that must contain specific values as defined in the Technical Framework (e.g., MSH-21 must be "1.3.6.1.4.1.19376.1.6.1.3.1").

If MSH-16 (Application Acknowledgement Type) is valued as "ER" or "AL", the IOC may report an application acknowledgement error using the Pharmacy/Treatment Give Acknowledgement Message (RRG^O16^RRG_O16) for errors such as:

• Unknown device

• Dose/rate and volume are not within vendor parameters for the device type.

• Drug is not present in onboard library.

If the message from the Infusion Order Programmer is rejected, the acknowledgement will contain the value AR or AE in MSA-1**,** based upon HL7 enhanced acknowledgment rules (see HL7 v2.6, Section 2.9.2.2). The reason for rejection is provided in the ERR segment.

Once the programming information is received by the pump, the clinician may choose to do one of the following: (1) confirm the settings on the pump and then start the infusion, (2) enter or modify one or more settings and then start the infusion, or (3) cancel the program altogether.

Once the infusion is started, the settings actually programmed as well as the current state of the infusion can be obtained using the PCD-01 (Communicate PCD Data) transaction.

3.3.5 RRG^O16^RRG_O16 Pharmacy/Treatment Give Acknowledgement Message

Table 3.3.5-1: RRG^O16^RRG_O16 Pharmacy/Treatment Give Acknowledgement Message

Segment	Meaning	Usage	Card	HL7 Chapter
MSH	Message Header	R	[1..1]	2
MSA	Message Acknowledgment	R	[1..1]	2
[{ ERR }]	Error	C	[0..1]	2
[{ SFT }]	Software	X		2
[{ NTE }]	Notes and Comments (for Header)	X		2
[	--- RESPONSE begin			
[	--- PATIENT begin			
PID	Patient Identification	X		3
[{ NTE }]	Notes and Comments (for PID)	X		2
]	--- PATIENT end			

Segment	Meaning	Usage	Card	HL7 Chapter
{	--- ORDER begin			
ORC	Common Order	X		4
[{	--- TIMING begin			
TQ1	Timing/Quantity	X		4
[{ TQ2 }]	Timing/Quantity Order Sequence	X		4
}]	--- TIMING end			
[	--- GIVE begin			
RXG	Pharmacy/Treatment Give	X		4
{	--- TIMING_GIVE begin			
TQ1	Timing/Quantity	X		4
[{ TQ2 }]	Timing/Quantity Order Sequence	X		4
}	--- TIMING_GIVE end			
{ RXR }	Pharmacy/Treatment Route	X		4
[{ RXC }]	Pharmacy/Treatment Component	X		4
]	--- GIVE end			
}	--- ORDER end			
]	--- RESPONSE end			

3.3.5.1 MSH – Message Header Segment

The MSH segment is defined in Appendix B.1.

3.3.5.2 MSA - Message Acknowledgement segment

The MSA segment is defined in Appendix B.2.

3.3.5.3 ERR - Error segment

The ERR Error segment is defined in Appendix B.3.

3.4 PCD-04 Report Alert

In anticipation of HL7 2.8 item 625, Add Alert Trigger Event, this profile is making forward looking use of the triggers and events from that item, specifically the use of ORU^R40 for [PCD-04], and the Participation Information (PRT) segment which is in 2.7. The ORA event is Observational Report – Application Acknowledgement.

This section corresponds to Transaction PCD-04 of the IHE Technical Framework. Transaction PCD-04 is used by the Alert Reporter and the Alert Manager (AM) actor.

3.4.1 Scope

This transaction is used by the Alert Reporter to report alerts to the Alert Manager (AM). The Alert Reporter (AR) sends alerts to the Alert Manager (AM) actor in an unsolicited manner.

3.4.2 Use Case Roles

990

Actor: Alert Reporter

Role: Sends Report Alert to the Alert Manager (AM)
Actor: Alert Manager (AM)

Role: Receives Report Alert from Alert Reporter

995 ### 3.4.3 Referenced Standards

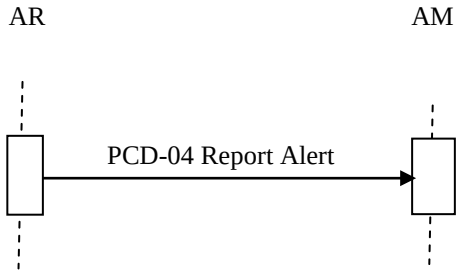
HL7 - Health Level 7 Version 2.6 Ch7 Observation Reporting

ISO/IEEE 11073-10201 Domain Information Model

ISO/IEEE 11073-10101 Nomenclature

3.4.4 Interaction Diagrams

1000 #### 3.4.4.1 AR reports to AM



AR sends Report Alert to AM as an HL7 ORU message.

3.4.4.1.1 HL7 Conformance Statement

The conformance statement for this interaction described below is adapted from HL7 2.6.

Table 3.4.4.1.1-1: PCD-04 Transaction Conformance

Publication ID:	R40
Type:	Unsolicited
Publication Name:	IHEPCD-04ReportAlert
Trigger:	None
Mode:	Immediate
Response:	ORU^R40^ORU_R40
Characteristics:	Sends defined alert data
Purpose:	Report Alert from AR to AM
Based on Segment Pattern:	R40

3.4.4.1.2 PCD-04 Report Alert (ORU^R40^ORU_R40) static definition

The PCD-04 Report Alert message is used to communicate ACM data from an Alert Reporter (AR) to Alert Manager (AM).

Common HL7 segments are defined in Appendix B Common Message Segments. For segments MSH, PID, PV1, ORD, OBR, OBX and NTE there are sections discussing considerations specific to PCD-04.

Table 3.4.4.1.2-1: ORU^R40^ORU_R40 HL7 Attribute table

ORU^R40^ORU_R40	ORU Message	Usage	Card.	Section Ref
MSH	Message Header Segment	R	[1..1]	2.15.9
PID	Patient Identification Segment	CE	[1..1]	3.4.2
PV1	Patient Visit Segment	CE	[1..1]	3.4.3
[ORC]	Common Order Segment	O	[0..1]	4.5.1
OBR	Observation Request Segment	R	[1..n]	7.4.1
PRT	Participation Information Segment	O	[0..n]	HL7 2.7 7.4.4
OBX	Observation Result Segment	R	[1..n]	7.4.2
[NTE]	Notes and Comments Segment	O	[0..1]	2.5.10

While there can be multiple OBR segments per PCD-04 transaction (in support of inclusion of evidentiary data) there is at most one alert per PCD-04 transaction.

Table 3.4.4.1.2-2: ORU^R40^ORU_R40 Static Definition

ORU^R40^ORU_R40	Report Alert Message
MSH	Message Header
[{SFT}]	Software Segment
{	--- ALERT_begin
[	--- PATIENT begin
PID	Patient Identification
[	--- LOCATION begin
PV1	Alert Location
]	--- LOCATION end
]	--- PATIENT end
{	--- ALERT_IDENTIFICATION begin
[ORC]	Alert Common
{OBR}	Alert Identification
[{	--- ALERT_OBSERVATION begin
{OBX}	Alert observation relative to OBR
{ [NTE] }	Notes and Comments
}]	--- ALERT OBSERVATION end
}	--- ALERT_IDENTIFICATION end
}	--- ALERT end

A single Report Alert [PCD-04] transaction contains at most one alert for a given patient and there must be an OBR preceding each group of OBX segments.

See Appendix B for details of the contents of each segment in the PCD-04 Transaction.

3.4.4.1.3 Trigger Events

The trigger event for a PCD-04 Transaction is that the AR has detected the onset, continuation of, or conclusion an event which may be an alert and sends it to the AM.

3.4.4.1.4 Message Semantics

This message is meant to convey from the AR actor to the AM actor the fact that an alert is occurring, is still occurring, or has ended along with the data related to the alert to identify the patient and/or location, the alerting condition, and any observations associated with the alert.

3.4.4.1.5 Expected Actions

HL7 ACK from the Alert Manager (AM) actor back to the Alert Reporter (AR) actor is used to communicate that the Alert Manager (AM) actor has received the Report Alert [PCD-04]

transaction from the Alert Reporter (AR) actor. The Report Alert [PCD-04] is asynchronous to Report Dissemination Alert Status [PCD-07] transactions by an indeterminate amount of time. HL7 ACK is therefore not used to report dissemination status of the alert as it would leave the Alert Reporter (AR) actor awaiting HL7 ACK receipt for an indeterminate amount of time.

While the AR to AM message [PCD-04] is one message it is likely to result in the potential for many messages from AM to AC and many messages from AC back to AM and from AM back to AR because of the possibility of multiple endpoint devices. Communication device operator response delays may result in delays of AC to AM and AM back to AR messages.

3.4.4.1.6 Security Considerations

During the Profile development there were no unusual security/privacy concerns identified. There are no mandatory security controls but the implementer is encouraged to use the underlying security and privacy profiles from ITI that are appropriate to the transports such as the Audit Trail and Node Authentication (ATNA) profile. The operational environment risk assessment, following ISO 80001, will determine the actual security and safety controls employed.

3.5 [PCD-05] Reserved

3.6 PCD-06 Disseminate Alert

This section corresponds to Transaction PCD-06 of the IHE Technical Framework. Transaction PCD-06 is used by the Alert Manager (AM) actor to disseminate alerts to the Alert Communicator (AC) actor.

3.6.1 Scope

This transaction is used by Alert Manager (AM) to disseminate the alert to the Alert Communicator (AC).

3.6.2 Use Case Roles

Actor: Alert Manager (AM)

Role: Sends Disseminate Alert to Alert Communicator (AC)

Actor: Alert Communicator (AC)

Role: Receives Disseminate Alert from the Alert Manager (AM)

3.6.3 Referenced Standard

The communication protocol between the AM and AC actors is WCTP. The communicated data items are in scope for this profile (for details see Appendix LMessage Transport Using WCTP (ACM Transactions PCD-06 and PCD-07)). The latest version of IHE PCD Rosetta Terminology Mapping (RTM) contains the list of standardized alert terms that may be used within PCD-04 messages (see IHE PCD wiki).

While alert related data items available to the AM are specified in this profile, the ability of individual communication devices to communicate, display, or respond to those data items is dependent upon the product capabilities and site specific configuration of the AC actor, the communication device, and the available communication infrastructure.

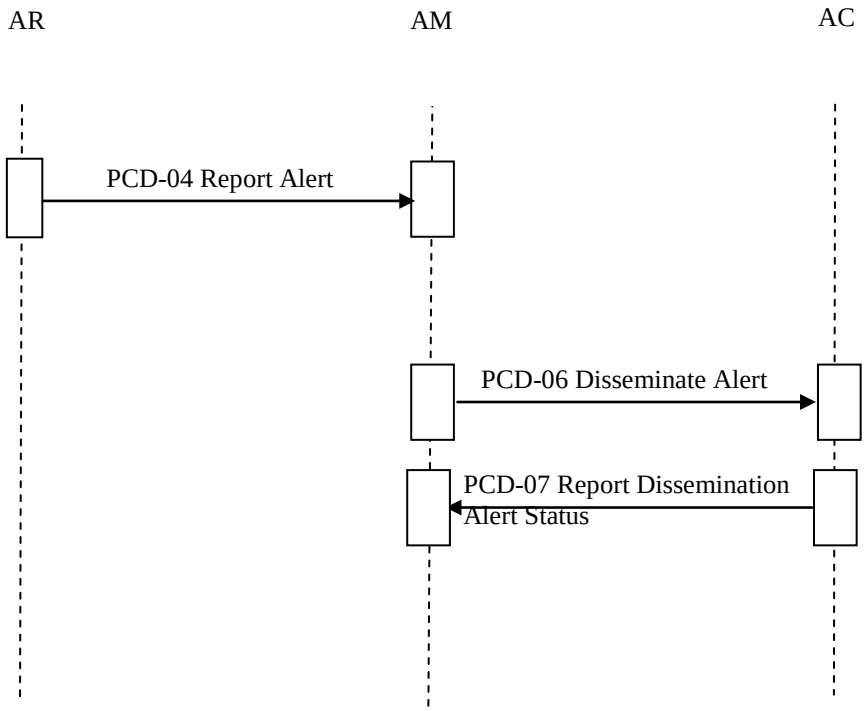
The Wireless Communications Transfer Protocol (WCTP) Protocol Specification version 1.3 update 1 (http://www.wctp.org/release/wctp-v1r3_update1.pdf)

ISO/IEEE 11073-10201 Domain Information Model

ISO/IEEE 11073-10101 Nomenclature

3.6.4 Interaction Diagrams

3.6.4.1 AM disseminate alert to AC



AM sends Disseminate Alert to AC. The protocol between the AM and AC actors is WCTP.

3.6.4.1.1 HL7 Conformance Statement

The communication protocol is WCTP. There is no specified HL7 conformance.

3.6.4.1.2 PCD-06 Disseminate Alert static definition

The PCD-06 Disseminate Alert message is used to communicate ACM data from an Alert Manager (AM) to the Alert Communicator (AC).

The text message within the PCD-06 transaction is meant to be readily recognized and acted upon by people. Cryptic encodings are to be avoided. Lengthy messages containing excessive amounts of unnecessarily detailed information are also to be avoided. Most communication device displays are limited in size. Long messages requires scrolling to review the entire message before acting upon it to make sure that no pertinent information is missed.

Additionally, the information, if sent to an endpoint communication device which lacks authentication and encryption, should be examined to avoid sending electronic patient healthcare information over such a connection and thereby exposing patient information.

If the PCD-06 includes a human readable text description of the alert indication, that is the preferred description to be presented on the wireless endpoint communication device. In the absence of such information the Alert Manager should produce the human readable text description from other information present in the transaction.

If, during communication negotiations between the AM and AC actors, the AC actor indicates it is unable to produce graphics from the evidentiary data then that information shall not be sent to the AC. Instead, the AM, if a regulated medical device and if capable, should send a graphical snippet prepared from the evidentiary data received in the Report Alert [PCD-04] transaction.

3.6.4.1.3 Trigger Events

The AM has determined that an alert needs to be disseminated and so sends it to the AC.

3.6.4.1.4 Message Semantics

This message communicates alerts to communication endpoint devices.

The table below lists the data items and their optionality. All of these data items are within the WCTP message text.

Table 3.6.4.1.4-1: PCD-06 static definition

PCD-06	Fields	Usage	Card.
Alert_Location	Alert associated location based upon information from PV1-3	CE	[1..1]
Alert_Patient	Patient Identification	CE	[1..1]
Alert_Text	Textual alert identification	R	[1..1]
Alert_Identifier	Alert unique identifier	O	[0..1]
Alert_Callback	Call back connection	O	[0..1]

PCD-06	Fields	Usage	Card.
	information		
Alert_Reference	URL or application link potentially containing alert or patient contextual information	O	[0..1]
Alert_Comment	Notes and Comments associated with alert	O	[0..1]
Alert_Evidentiary_Data	Evidentiary data associated with alert See Appendix K for WCTP messaging information	O	[0..1]
Alert_Evidentiary_Graphic	Evidentiary data transformed into a graphical image (SVG and/or PNG) See Appendix K for WCTP messaging information.	O	[0..1]

3.6.4.1.5 Expected Actions

AC sends alert to endpoint. If the endpoint is a group then the AC is expected to send the alert notification to all members of the group.

3.6.4.1.6 Security Considerations

This profile while utilizing communication capabilities supportive of authentication, encryption, or auditing, does not impose specific requirements leaving these matters to site-specific policy or agreement. During the Profile development there were no unusual security/privacy concerns identified. There are no mandatory security controls but the implementer is encouraged to use the underlying security and privacy profiles from ITI that are appropriate to the transports such as the Audit Trail and Node Authentication (ATNA) profile. The operational environment risk assessment, following ISO 80001, will determine the actual security and safety controls employed.

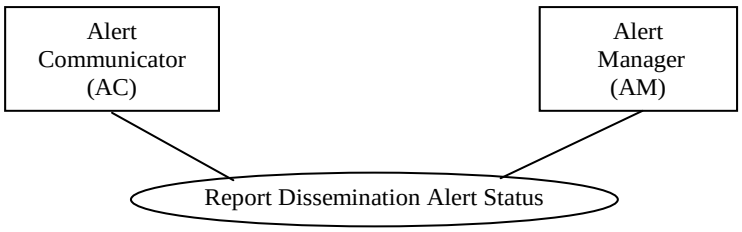
3.7 PCD-07 Report Dissemination Alert Status

This section corresponds to Transaction PCD-07 of the IHE Technical Framework. Transaction PCD-07 is used by the Alert Communicator actor to signal dissemination status updates and replies to the Alert Manager (AM).

3.7.1 Scope

This transaction is used by Alert Communicator to report one or more dissemination status updates and/or replies to the Alert Manager (AM). A single PCD-06 transaction from the AM to the AC can result in numerous PCD-07 transactions from the AC back to the AM.

3.7.2 Use Case Roles



Actor: Alert Communicator (AC)

Role: Sends Dissemination Status to the Alert Manager (AM)
Actor: Alert Manager (AM)

Role: Receives Dissemination Status from the Alert Communicator (AC)

3.7.3 Referenced Standards

WCTP version 1.3 update 1

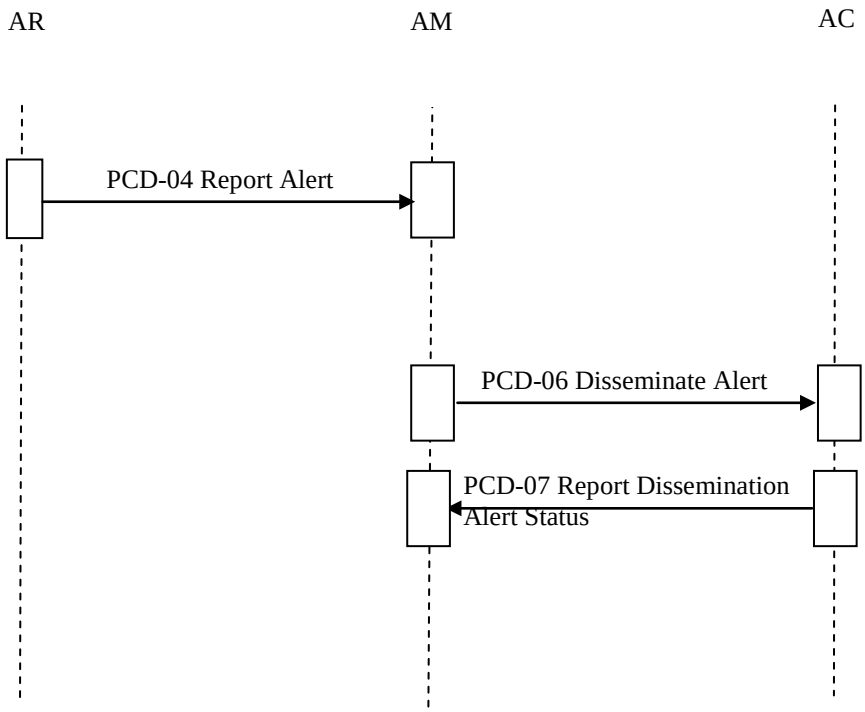
ISO/IEEE 11073-10201 Domain Information Model

ISO/IEEE 11073-10101 Nomenclature

The communication protocol is WCTP, the same as for the Disseminate Alert [PCD-06] transaction. See Appendix L, Message Transport Using WCTP (ACM Transactions PCD-06 and PCD-07) for details.

3.7.4 Interaction Diagrams

3.7.4.1 AC status updates to AM



The AC sends Dissemination Status to the AM actor. The protocol utilized is WCTP.

3.7.4.1.1 Trigger Events

The AC has determined a dissemination status update needs to be sent to the AM.

The following table lists the results of the dissemination from the AC back to the AM. The required Communication Status Enumerations are indicated.

Table 3.7.4.1.1-1: Status Enumerations

Usage	Communication Status Enumeration
R	Received by communications (accepted by WCTP gateway)
O	Undeliverable to endpoint Optional in support of one-way devices, such as pagers.
O	Delivered to endpoint Optional in support of one-way devices, such as pagers.
O	Read at endpoint Optional in support of one-way devices, such as pagers.
O	Accepted by endpoint Optional in support of one-way devices, such as pagers.
O	Accepted by endpoint as true positive
O	Accepted by endpoint as true positive however not clinically relevant

Usage	Communication Status Enumeration
O	Accepted by endpoint as false positive
O	Rejected by endpoint Optional in support of one-way devices, such as pagers.
O	Cancelled by endpoint
O	Cancelled by other than endpoint
O	Callback start at endpoint See Appendix K for WCTP messaging details. Optional as not supported by all notification devices.
O	Callback end at endpoint See Appendix K for WCTP messaging details. Optional as not supported by all notification devices.
O	Completed by endpoint operator Optional in support of one-way devices, such as pagers.

A single PCD-04 to PCD-06 transaction may go through multiple communications status updates as the alert is communicated to the endpoint user or application. Which of the status updates are possible is AC actor and endpoint implementation dependent. Some endpoint devices are output only and do not support two-way capabilities. Some devices and services offer transmission confirmation. More advanced communications endpoints offer two-way capabilities allowing the operator of the endpoint to accept or cancel the alert.

Detailed reason for status can optionally be included to encompass the concept of presence (see WCTP interface specification) to allow for messages not making it to the endpoint or being rejected by the endpoint due to a presence state such as offline, busy, or do not disturb.

3.7.4.1.2 Message Semantics

This message is used to communicate status updates on the communication of an alert to endpoints. See Appendix K for WCTP messaging specifics.

3.7.4.1.3 HL7 Conformance Statement

The communication protocol is WCTP. There is no specified HL7 conformance.

3.7.4.1.4 PCD-07 Report Dissemination Alert Status static definition

The PCD-07 Dissemination Status message is used to communicate ACM messaging status and replies from an Alert Communicator (AC) to Alert Manager (AM)

The Alert Communicator (AC) actor is not responsible for indicating that the endpoint operator has received but not responded to the notification – as in received sending delivered to device status, automatically displayed which may or may not send back read indication, but no operator interaction. Actions for non-response by the Alert Communicator (AC) endpoint operator (clinical user) (escalation or sending to alternate devices) is within the scope of the Alert

Manager (AM) actor. Such actions have been identified within the ACM Trial Implementation as out of scope for the ACM profile.

The endpoint device message communication protocol between the Alert Communicator and the endpoint device is outside the scope of the profile. The data presentation by the endpoint device is outside the scope of the profile.

The table below lists the data items and their optionality.

Table 3.7.4.1.4-1: PCD-07 static definition

PCD-07	ORU Message	Usage	Card.
Alert _Identifier	Alert unique identifier (see PCD-06)	R	[1..1]
Alert _Status	Communication Status Enumeration item	R	[1..1]

3.7.4.1.5 Expected Actions

Based upon the status of the delivery or the operator response the AM may affect changes in its own internal escalation process to select and send the message to a different device associated with the same user or a device associated with a different user.

3.7.4.1.6 Security Considerations

This profile while utilizing communication capabilities supportive of authentication, encryption, or auditing, does not impose specific requirements leaving these matters to site-specific policy or agreement. The IHE PCD Technical Framework identifies security requirements across all PCD profiles. During the Profile development there were no unusual security/privacy concerns identified. There are no mandatory security controls but the implementer is encouraged to use the underlying security and privacy profiles from ITI that are appropriate to the transports such as the Audit Trail and Node Authentication (ATNA) profile. The operational environment risk assessment, following ISO 80001, will determine the actual security and safety controls employed.

3.8 [PCD-08] Reserved

3.9 PCD-09 Communicate IDC Observations

This section corresponds to transaction PCD-0] of the IHE Technical Framework. Transaction PCD-0] is used by the Implantable Device – Cardiac – Reporter and Implantable Device – Cardiac – Consumer actors.

3.9.1 Scope

In the Communicate IDC Observation transaction, the Implantable Device – Cardiac – Reporter sends the observation as an unsolicited HL7 ORU message to the Implantable Device – Cardiac – Consumer actor.

3.9.2 Use Case Roles

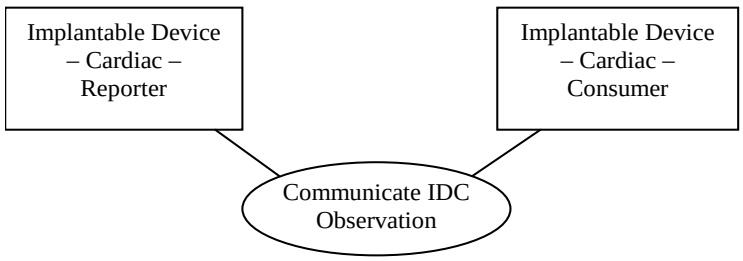


Figure 3.9.2-1: Communicate IDC Observation

Actor: Implantable Device – Cardiac – Reporter

Role: Outputs the Observation as an HL7 ORU message upon completion of the observation. This message contains the discrete data for the observation and/or a PDF document containing displayable data relating to the observation.

Actor: Implantable Device – Cardiac – Consumer

Role: Receives the HL7 ORU message and provides some implementation-specific processing. This may include creation of reports, integration of information into electronic health records, or creation of derived data (trends, analyses, reformatted data, population statistics, etc.). If needed, it will reconcile patient identification using an implementation-specific mapping function.

3.9.3 Referenced Standard

HL7 Messaging Standard v2.6

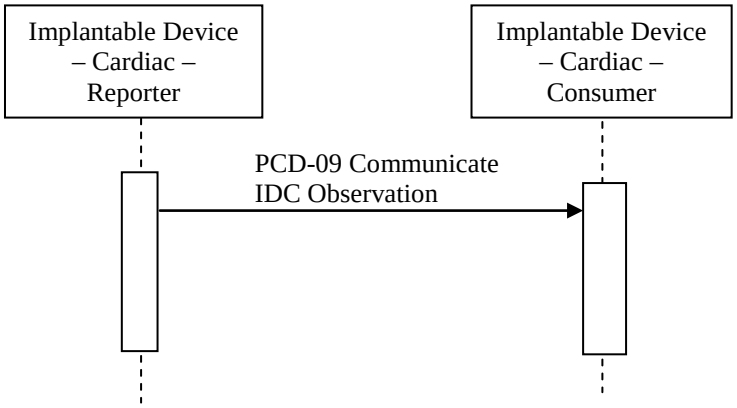
NOTE – The IDCO is functional with HL7 Messaging Standard v2.5. The only change required is when specifying in the message header which version is being used.

ISO 19005-1. Document management – Electronic document file format for long-term preservation – Part 1: Use of PDF (PDF/A)

UCUM: Unified Code for Units of Measure, Regenstrief Institute for Health Care, Indianapolis 2005. Version 1.6

IEEE 11073_10103 MDC_IDC Nomenclature

3.9.4 Interaction Diagram



3.9.4.1 HL7 ORU Observation

This is a standard HL7 v2.6 unsolicited orders and observation message containing the observations taken by the implanted device. Information is coded using the IEEE 11073-10103 IDC Nomenclature.

3.9.4.1.1 Trigger Events

The Implantable Device – Cardiac – Reporter initiates the HL7 ORU message to the Implantable Device – Cardiac – Consumer following an implanted cardiac device interrogation.

3.9.4.1.2 Message Semantics

The message is an unsolicited v2.6 ORU message from the Implantable Device – Cardiac – Reporter to the Implantable Device – Cardiac – Consumer with a corresponding ACK message back to the Implantable Device – Cardiac – Reporter. The contents of the message (in OBX segments) are a required set of individual observations or measurements trans-coded into separate HL7 v2.6 OBX segments and an optional encapsulated PDF document.

Refer to the HL7 v2.6 Standard, Chapter 7 ORU Message for general message semantics.

The constrained message structure is given in table 3.9.4.1.2-1, with additional details provided in sections below.

Table 3.9.4.1.2-1: ORU Message Structure

ORU	Observation Results Message	Usage	Card	HL7 Spec Chapter
MSH	Message Header		[1..1]	2
[{ SFT }]	Software Segment		[0..1]	2
PID	Patient Identification	Demographics for id matching	[1..1]	3
[PV1]	Patient Visit		[0..1]	3
{	Order Observation Repeat Grouping BEGIN		[1..*]	
OBR	Observations Request	Clinical context	[1..1]	7
{[NTE]}	Notes Section	Notes related to OBR	[0..*]	
{OBX}	Observation results	Observations related to the pulse generator	[0..*]	7
{[NTE]}	Notes Section	Notes Related to OBX	[0..*]	
}	Order Observation Repeat Grouping END			
[DSC]	Continuation Pointer		[0..0]	2

3.9.4.1.2.1 MSH Segment – Message Header

Table 3.9.4.1.2.1-1: MSH Segment

Name	Seq	DT	Len	Opt	Rep	Min	Max	Tbl	Fixed	Ex Val
Field Separator	1	ST	1	R	False	1	1		Y	|
Encoding Characters	2	ST	4	R	False	1	1		Y	^~\&
Sending Application	3	HD	227	RE	False	0	1	0361		
namespace ID	*1*	IS	20	O		0	1	0300		APP NAME
Sending Facility	4	HD	227	RE	False	0	1	0362		
namespace ID	*1*	*IS*	*20*	*O*		*0*	*1*	*0300*		*VENDOR NAME*
Receiving Application	5	HD	227	RE	False	0	1	0361		
namespace ID	*1*	*IS*	*20*	*O*		*0*	*1*	*0300*		*CLINIC APPLICATION*
Receiving Facility	6	HD	227	RE	False	0	1	0362		
namespace ID	1	IS	20	O		0	1	0300		CLINIC ID
Date/Time Of Message	7	TS	26	R	False	1	1			
time	*1*	DTM	24	R		1	1			20040328134623.1234+0300
Message Type	9	MSG	15	R	False	1	1			
message code	*1*	ID	3	R		1	1	0076	Y	ORU
trigger event	*2*	ID	3	R		1	1		Y	R01

Name	Seq	DT	Len	Opt	Rep	Min	Max	Tbl	Fixed	Ex Val
								0003		
message structure id	*3*	ID	3	R		1	1	0003	Y	ORU_R01
Message Control ID	10	ST	20	R	False	1	1			1234567890
Processing ID	11	PT	3	R	False	1	1			
processing ID	*1*	ID	1	R		1	1	0103	Y	P
Version ID	12	VID	971	R	False	1	1			
version ID	*1*	ID	5	R		1	1	0104	Y	2.6

Note: Field names are in Roman type, relevant component names within a field are listed underneath in italic type.

MSH-11.1 Processing ID

MSH-11 is used to indicate how a message is processed as defined in the HL7 Application (level 7) Processing rules. Requires one of the following:

- D – Debugging
- P – Production
- T – Training

3.9.4.1.2.2 PID Segment – Patient Identification

Table 3.9.4.1.2.2-1: PID Segment

Name	Seq	DT	Len	Opt	Rep	Min	Max	Tbl	Fixed Val	Ex Val
Set ID - PID										
Patient Identifier List	3	CX	250	R	True	1	*			
ID number	*1*	ST	199	R		1	1			MODEL:XXX/SERIAL:XXX
Assigning authority	*4*	HD	227	R		0	0	0363		BSC
identifier type code	*5*	ID	5	O		0	1	0203		U
Patient Name	5	XPN	294	RE	True	1	*			
family name	*1*	FN	194	O		0	1			DOE
given name	*2*	ST	30	O		0	1			JOHN
second and further given names or initials thereof	*3*	ST	30	O		0	1			S
suffix (e.g., JR or III)	*4*	ST	20	O		0	1			JR
Date/Time of Birth	7	TS	26	RE	False	0	1			
time	*1*		24	RE		1	1			19600328

Name	Seq	DT	Len	Opt	Rep	Min	Max	Tbl	Fixed Val	Ex Val
		DTM								
Administrative Sex	8	IS	1	RE	False	0	1	0001		M
Patient Address	11	XAD	513	RE	True	0	*			
street address	*1*	SAD	184	O		0	1			12345 Some Street
other designation	*2*	ST	120	O		0	1			Apartment 123
city	*3*	ST	50	O		0	1			Town
state or province	*4*	ST	50	O		0	1			MN
zip or postal code	*5*	ST	12	O		0	1			12345
country	*6*	ID	3	O		0	1	0399		USA

Note: Field names are in Roman type, relevant component names within a field are listed underneath in italic type.

PID-3.1 Patient Identifier List

ID Number contains a unique identifier for the patient assigned by the Implantable Device – Cardiac – Reporter. Identifier Type Code is constrained by Table 0203 listed below (others can be included as defined in the 2.6 standard). The first identifier will always be the unique model/serial number of the implanted device with an identifier of type U (see table following). This will be used by the Implantable Device – Cardiac – Consumer / Repository actor to match the device interrogations with the patient accounts. Assigning Authority will be a unique name of the Implantable Device – Cardiac – Reporter system or owning organization that creates the observation and will be coded using the MDC_IDC Nomenclature, MDC_IDC_DEV_MFG term.

Table 3.9.4.1.2.2-2: HL7 Table 0203

Code	Description	Notes	Usage
U	Model and Serial Number of Device IEEE 11073_10103 MDC_IDC_DEV_MODEL and MDC_IDC_DEV_SERIAL	Model and Serial number will be concatenated together and will be unique within an Assigning Authority. The format of the ID will be following: "model:xxx/serial:yyy" Example: model:XZY987/serial:abc123	R
SS	Patient Social Security Number	Social Security number will be included if known.	RE

3.9.4.1.2.3PV1 Segment – Patient Visit (Optional)

Table 3.9.4.1.2.3-1: PV1 Segment

Name	Seq	DT	Len	Opt	Rep	Min	Max	Tbl	Fixed Value	Ex Val
Set ID - PV1	1	SI	4	O	False	0	1			1
Patient Class	2	IS	1	R	False	1	1	0004		R
Attending Doctor	7	XCN	309	O	True	0	*	0010		
ID number	*1*	ST	15	O		0	1			MWELBY
family name	*2*	FN	194	O		0	1			Welby
given name	*3*	ST	30	O		0	1			Marcus
second and further given names or initials thereof	*4*	ST	30	O		0	1			A
suffix (e.g., JR or III)	*5*	ST	20	O		0	1			III
prefix (e.g., DR)	*6*	ST	20	O		0	1			DR
Visit Number	19	CX	250	O	False	0	1			
ID number	*1*	ST	15	O		0	1			123456

Note: Field names are in Roman type, relevant component names within a field are listed underneath in italic type.

Because this is an unsolicited observation and the Implantable Device – Cardiac – Reporter will not be aware of an associated order, this segment is optional. The Implantable Device – Cardiac – Reporter may want to track the interrogation as a visit using this segment. If information is provided here it will match corresponding information provided in the OBX segments.

PV1-7 Attending Doctor will optionally be captured by the Implantable Device – Cardiac – Reporter actor. If present, PV1-7.1 Attending Doctor ID Number will be a unique identifier for each doctor in the context of the Implantable Device – Cardiac – Reporter actor, not the Implantable Device – Cardiac – Consumer actor.

PV1-19 Visit Number, ID Number will be a unique identifier generated by the Implantable Device – Cardiac – Reporter for each visit.

3.9.4.1.2.4 OBR Segment – Observation Request

The ORU message may include discrete OBX segments for individual observations reported. An OBR Segment will be used for each set of such OBX segments to establish the equipment context for the observations (i.e., whether the interrogation was done in-clinic or remote). All observation dates and times reported here should match OBX segments that report the same information.

Table 3.9.4.1.2.4-1: OBR Segment

Name	Seq	DT	Len	Opt	Rep	Min	Max	Tbl	Fixed Val	Ex Val
Set ID – OBR	1	SI	4	O	False	0	1			1
Placer Order Number	2	EI	424	O	False	0	1			
entity identifier	*1*	ST	199	O		0	1			
Filler Order Number	3	EI	424	R	False	0	1			
entity identifier	*1*	ST	199	O		0	1			123456
Universal Service Identifier	4	CWE	478	R	False	1	1			
identifier	*1*	ST	20	R		1	1			Remote
text	*2*	ST	199	O		0	1			
Observation Date/Time	7	TS	26	C	False	0	1			
time	*1*	DTM	24	R		1	1			20040328134623.1234+0300
Observation End Date/Time	8	TS	26	O	False	0	1			
time	*1*	DTM	24	R		1	1			20040328134623.1234+0300
Results Rpt/Status Chng - Date/Time	22	TS	26	C	False	0	1			
Time	*1*	DTM	24	R		1	1			20040328134623.1234+0300
Result Status	25	ID	1	C	False	0	1	0123		F

Note: Field names are in Roman type, relevant component names within a field are listed underneath in italic type.

OBR-2 Placer Order Number will usually be empty given that this is an unsolicited order.

OBR-3 Filler Order Number will contain a unique identifier for the observation / interrogation session generated by the Implantable Device – Cardiac – Reporter actor.

OBR-4.1-2 Universal Service ID, Identifier and Text can identify unique OBR segments that partition observations. The values for this field will be taken from the 11073_10103 MDC_IDC_SESS_TYPE enumerator MDC_IDC_ENUM_SESS_TYPE.

OBR-25 Result Status values will be one of the values in table 3.9.4.1.2.4-2.

Table 3.9.4.1.2.4-2: Result Status

Value	Description
R	Results stored; not yet verified
P	Preliminary: A verified early result is available, final results not yet obtained
F	Final results; results stored and verified. Can only be changed with a corrected result.
C	Correction to results

3.9.4.1.2.5 OBX Segments – Pulse Generator and Lead Observation Results

Discrete OBX segments for individual observations will be encoded into separate OBX segments as individual observations or measurements. These OBX segments will be preceded by an appropriate OBR segment (see 3.9.4.1.2.4) to set the context for observations dealing with the implantable devices or leads.

Table 3.9.4.1.2.5-1: OBX Segment

Name	Seq	DT	Len	Opt	Rep	Min	Max	Tbl	Fixed Value	Ex Val
Set ID - OBX	1	SI	4	R	False	0	1			1
Value Type	2	ID	3	R	False	0	1	0125		CWE
Observation Identifier	3	CWE	478	R	False	1	1			
identifier	*1*	ST	20	R		1	1			720897
text	*2*	ST	199	O		0	1			MDC_IDC_DEV_TYPE
name of coding system	*3*	ID	20	R		0	1	0396		MDC
Observation Sub-ID	4	ST	20	RE	False	0	1			1
Observation Value	5	varies	99999	RE	True	0	*			ICD
Units	6	CWE	478	RE	False	0	1			
identifier	*1*	ST	20	RE		0	1			
text	*2*	ST	199	O		0	1			
Abnormal Flags	8	IS	5	O	True	0	*	0078		
Observation Result Status	11	ID	1	R	False	1	1	0085		
Date/Time of the Observation	14	TS	26	RE	False	0	1			
time	*1*	DTM	24	RE		1	1			20070422170125
Observation Method	17	CWE	478	O	True	0	*			
identifier	*1*	ST	20	R		0	1			
text	*2*	ST	199	R		0	1			

Name	Seq	DT	Len	Opt	Rep	Min	Max	Tbl	Fixed Value	Ex Val
Equipment Instance Identifier	18	EI	424	O	True	0	*			
entity identifier	*1*	ST	199	O		0	1			

Note: Field names are in Roman type, relevant component names within a field are listed underneath in italic type.

OBX-1 Set ID – This field contains the sequence number.

OBX-2 Value Type – The HL7 data type of the Observation Value will depend on the P11073_10103 term data type, as shown in table 3.9.4.1.2-9.

Table 3.9.4.1.2.5-2: IEEE to HL7 Data Type Matching

Applicable IEEE 11073 MDC_IDC types	HL7 v2 data type
String	ST
Enumerated	CWE or CNE
Date Time	DTM
Numeric	NM
Structured Numeric	SN (See Note)

Note: The Structured Numeric type (SN) is used for numeric terms that require qualifications. SN types will only be qualified as >value or <value.

OBX-3.1 Observation Identifier, Identifier shall be <Code> [numeric] as defined in Annex C.3 ‘Expanded Terms’ of IEEE 11073-10103 (see 3.9.3 Referenced Standards).

OBX-3.2 Observation Identifier, shall be <Reference ID> as defined in Annex C.3 ‘Expanded Terms’ in IEEE 11073-10103 (see 3.9.3 Referenced Standards)

OBX-3.3 Observation Identifier, Name of Coding System shall be MDC to reference the group of medical device communication standards (IEEE 11073-xxxxx)

OBX-4 Observation Sub-ID – If a value is provided here the embedded PDF will contain data related to a specific episode or EGM being referenced via grouping to other episode related data elements having the same Sub-ID in OBX-4 inside this message.

OBX-5 Observation Value – This is the actual value of the observation.

If OBX-2 is of type CWE then

OBX-5.1 shall be <Code> [numeric] as defined in Annex D.3 ‘enumerations’ or Annex E.3 ‘vendor enumerations’ of IEEE 11073-10103 (see 3.9.3 Referenced Standards) .

OBX-5.2 shall be <Enumerator Identifier>_<EnumerationCode [mnemonic]> as defined in Annex D.3 ‘enumerations’ or Annex E.3 ‘vendor enumerations’ in IEEE 11073-10103 (see 3.9.3 Referenced Standards)

OBX-5.3 shall be MDC to reference the group of medical device communication standards (IEEE 11073-xxxxx)

OBX-5.9 may contain the according Display Name as defined in Annex D.3 ‘enumerations’ or Annex E.3 ‘vendor enumerations’ of IEEE 11073-10103 (see 3.9.3 Referenced Standard) or an equivalent (maybe more compact) localized display name. If the vendor has implemented vendor-specific extensions (per IEEE 11073-10103 Sections 8 and A.4) than OBX-5.9 is required. This display name should only be used by the receiving system as a reference or if the Identifier in OBX-5.1 is unknown to the receiver (e.g., for proprietary vendor content). Generation and localization of display in the receiving system shall always be preferred.

OBX-6 Unit – Will be coded with the MDC_IDC Nomenclature (based on UCUM) Unit for associated observation.

OBX-8 Abnormal Flags – This field will contain a code from the extended User-defined Table 0078 – Abnormal Flags as specified below.

Table 3.9.4.1.2.5-3: User-defined Table – 078 Abnormal Flags

Value	Extended Value?	Description	Comment
NI	Yes	No information. There is no information which can be inferred. from this exceptional value.	No value is provided in OBX-5.
NAV	Yes	Temporarily not available. Information is not available at this time but it is expected that it will be available later.	No value is provided in OBX-5.
OFF	Yes	Numeric measurement function is available but has been deactivated by user.	No value is provided in OBX-5.
>	N	Above absolute high-off instrument scale.	Provide the high-off instrument scale number in OBX-5 if available.
<	N	Below absolute low-off instrument scale.	Provide the low-off instrument scale number in OBX-5 if available.

OBX-11 Observation Result Status – This field holds the value from the table *HL7 Table 0085 - Observation result status codes interpretation.* Valid values are following: F, P, R, S, & X. The value N or X denotes a missing or null value, and in this case the OBX-5 will be empty.

OBX-14 Date/Time of Observation – This field is required when the observation reported is different from the OBR report header. If an observation method is reported in OBX-17 the date will represent end date/time of the reported time interval.

OBX-18 Equipment Instance Identifier – A unique identifier for the equipment or software that was responsible for the production of the observation

3.9.4.1.2.6 IEEE 1073.1.1.3 IDC term mapping to OBX segment

In the IEEE 11073_10103 MDC_IDC nomenclature for Observation Identifiers (OBX-3) each term is discrete, self descriptive and maps to one OBX segment. Refer to the IEEE 11073_10103 MDC_IDC standard for information concerning the IDC nomenclature.

3.9.4.1.2.7 OBX Segment with Encapsulated PDF or Reference Pointer to External Report [Optional]

Optionally, observations or additional analyses may be provided in an encapsulated PDF containing displayable information or as a reference pointer to an external report.

Table 3.9.4.1.2.7-1: OBX Segment

Name	Seq	DT	Len	Opt	Rep	Min	Max	Tbl	Fixed Value	Ex Val
Set ID - OBX	1	SI	4	R	False	0	1			
Value Type	2	ID	2	R	False	0	1	0125	Y	ED
Observation Identifier	3	CWE	478	R	False	1	1			
identifier	1	ST	20	R		1	1		Y	*18750-0*
Text	2	ST	199	R		0	1		Y	Cardiac Electrophysiology Report
name of coding system	3	ID	20	R		0	1	0396	Y	LN
Observation Sub-ID	4	ST	20	RE	False					1
Observation Value	5	ED	99999	R	True	0	*			Encapsulated PDF
source application	1	ST	10	RE		1	1		Y	Application
type of data	2	ST	10	RE		1	1		Y	PDF
Encoding	4	ST	10	RE		1	1		Y	Base64
Data	5	ED	*	RE		1	1		Y	*Encapsulated and Base64 binary encoded PDF File*
Observation Result Status	11	ID	1	R	False	1	1	0085		
Date/Time of the Observation	14	TS	26	RE	False	0	1			
Time	1	DTM	24	R		1	1			20040328134623.1234+0300

Note: Field names are in Roman type, relevant component names within a field are listed underneath in italic type.

OBX-2 If sending an encapsulated PDF the value will be ED. If referencing an external report the value will be RP.

OBX-3 Value is a report ID from the LOINC coding system, and will be set to `18750-0^Cardiac Electrophysiology Report^LN.`

OBX-4 If a value is provided here the embedded PDF will contain data related to a specific episode or EGM being referenced via grouping to other episode related data elements having the same Sub-ID in OBX-4 inside this message.

OBX-5 If referencing an external document the Observation Value will contain a reference pointer to the external document.

OBX-5.1 If sending an encapsulated PDF the Type of Data component will have the value "Application"

OBX-5.2 If sending an encapsulated PDF the Data Subtype component will have the value "PDF".

OBX-5.3 Will be empty

OBX-5.4 If sending an encapsulated PDF the Encoding component will have the value "Base64".

OBX-5.5 If sending an encapsulated PDF the Data component contains the encapsulated Base64-encoded PDF/A document in accordance with ISO 19005-1.

Notes: 1. An actor participating in this transaction must support encapsulated data with a length beyond the nominal 65536 byte limit of the OBX-5.

2. The base64 encoded stream must not include CR/LF characters, which are forbidden within HL7 field text streams. Breaking a base64 encoded stream into lines of 76 characters or less is used for email in accordance with RFC 822, but is not applicable to encapsulated data in HL7.
The attached PDF or externally referenced report will contain in its content the device ID, patient ID and name if known, and the dates of the procedure and document.

3.9.4.1.2.8 NTE Segment – Notes and Comments [Optional]

Table 3.9.4.1.2.8-1: NTE Segment – Notes and Comments

ELEMENT NAME	SEQ	COMP	DT	LEN	USAGE	CARD	TBL #	ITEM #	Fixed	Ex. Values
Set ID - NTE	1		SI	4	O	[1..1]		00096		1
Source of comment	2		CX	20	O	[1..1]		00097	Y	L
Comment	3		FT	65536	O	[1..*]		01318		

NTE-3 Comments – Contains any notes, comments needed that are not included as part of an observation.

3.9.4.1.3 Expected Actions

3.9.4.1.3.1 Implantable Device – Cardiac – Consumer

The Implantable Device – Cardiac – Consumer actor will return the standard HL7 acknowledgement message to the Device Observation Creator.

3.9.5 Security Considerations

This profile does not require the use of ATNA. There are several implementation models for this profile that do not require transmission of data over public networks including intra-institutional, VPN, etc. However, when public networks are used, ATNA is one option for secure transport over those networks. It is recommended that the Implantable Device – Cardiac – Reporter actor be grouped with the Secure Node actor of the ATNA Profile to secure communications for remote follow-ups if data is sent across an un-trusted network.

Appendix A Mapping ISO/IEEE 11073 Domain Information Model to HL7

Figure A-1: System Package Model, represents the system level containment of the 11073 DIM.

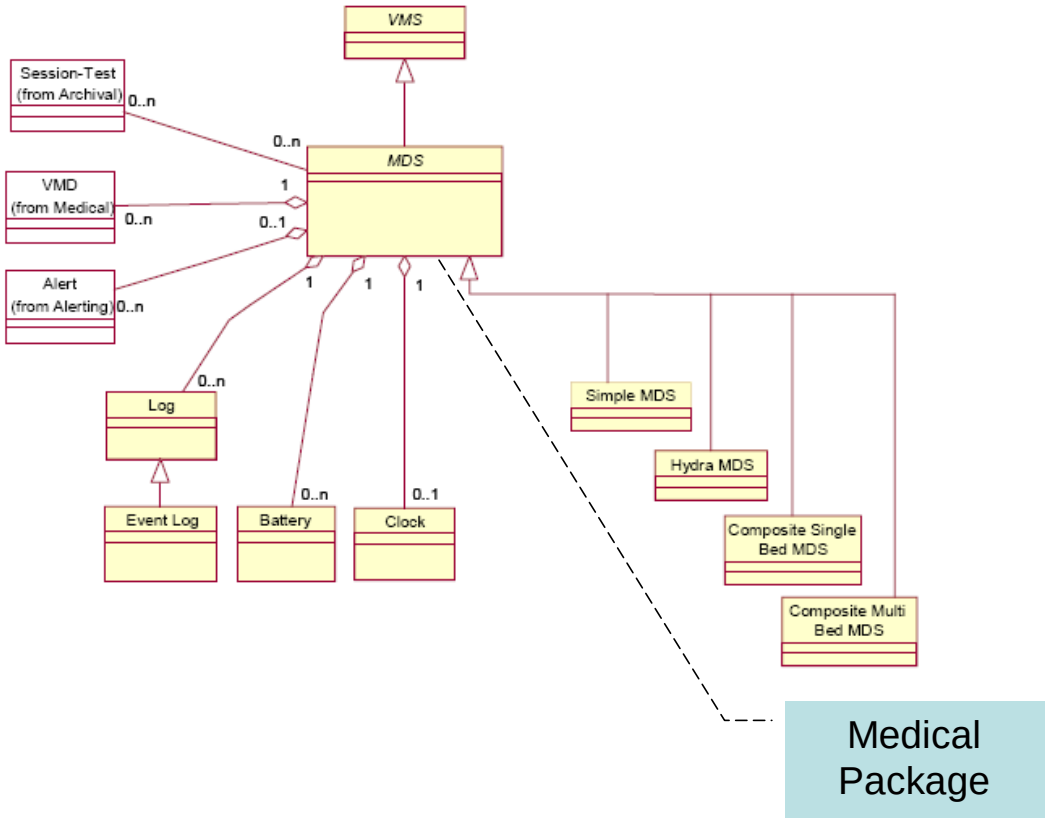


Figure A-1: System Package Model

The mapping from 11073 to HL7 will be described by focusing on the Medical Package defined by the Medical Device System shown in Figure A-1: System Package Model and elaborated in Figure A-2: Medical Package Model.

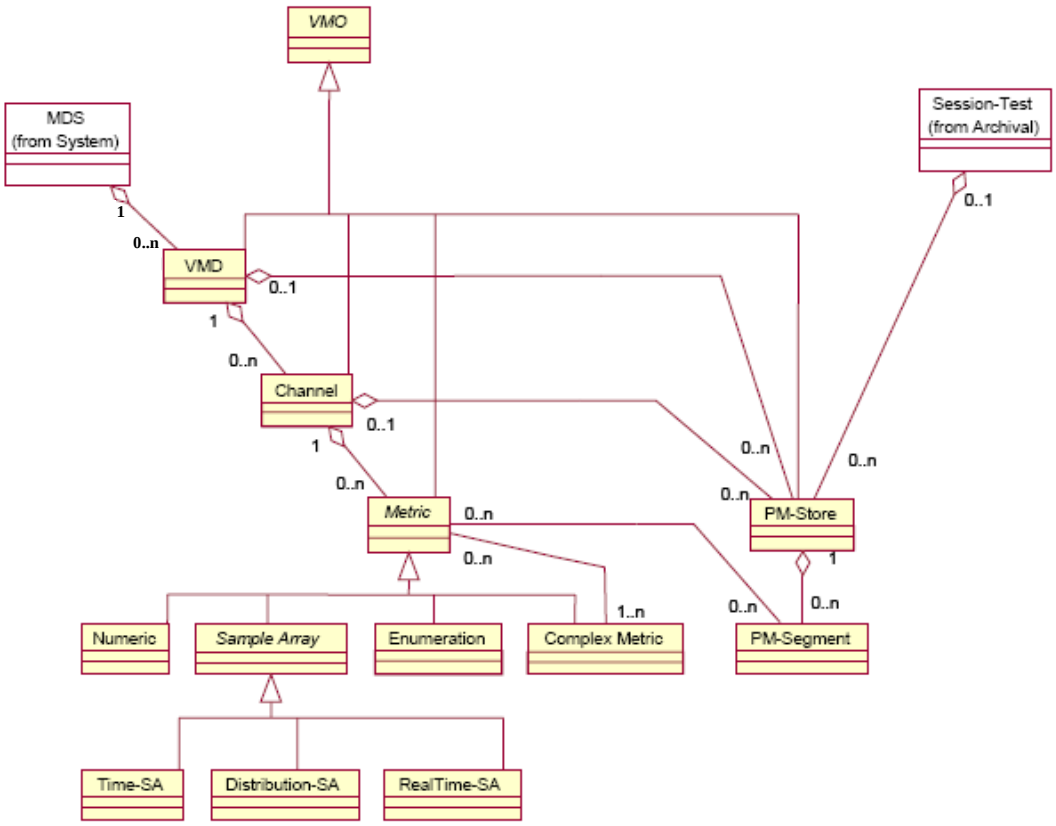


Figure A-2: Medical Package Model

The HL7 OBX segment provides two fields which are used in mapping the objects shown in Figure A-2: Medical Package Model; these are OBX-3 Observation Identifier and OBX-4 Observation Sub-Id.

OBX-3 is expressed as an HL7 Coded Element With Exceptions (CWE) data type and the details of mapping the 11073 MDC to the HL7 CWE datatype are described in Appendix A.1 ISO/IEEE Nomenclature mapping to HL7 OBX-3.

OBX-4 is used to express the containment level of a particular item expressed in OBX-3. This is done by defining the nodes of the <MDS> <VMD> <CHAN> <METRIC> hierarchy of the containment tree as a set of ordinal numbers expressed in a dotted notation such that each OBX-3 is expressed unambiguously in terms of its containment as defined by OBX-4. This may be supplemented by a further level or levels to distinguish attributes or other subordinate structures as may be specified in particular PCD profiles. See under OBX-4 in Appendix B for the details of the "dotted notation" used to express this containment.

Subject	Containment Tree Hierarchical Level			
Medical:	<mds>	<vmd>	<chan>	<parametric instance>

		OBX-4			
Examples					
1	Virtual (Medical)	<VS Mon>	<PulsOxim>	<Oxim>	<Spo2>
	Ordinal	1	1	1	1
2	Virtual (Medical)	<VS Mon>	<PulsOxim>	<Ptach>	<PR>
	Ordinal	1	1	2	2
3	Virtual (Medical)	<VS Mon>	<ECG>	<Ctach>	<HR>
	Ordinal	1	2	1	3

Recommend that Ordinal value is unique among entire set

Figure A-3: Example of Mapping Containment to OBX-4

For example the OBX-4 for the <VS Mon> <ECG> <Ctach> <HR> would be expressed as 1.2.1.3.

In OBX-2 the valid HL7 types for the mapping are NM, ST, SN, CWE, CF (String may have some implied structure)

The specification of the containment tree provides a mechanism to address dynamic configuration of a PCD. For example, a patient monitor may have one or more "plug-ins" which may be added to and removed from the patient monitor as the patient's clinical condition changes. These should be individually identifiable by a unique device instance identifier. When a plug-in is removed, the ordinal numbers previously assigned to that plug-in should be reserved. Addition of a new plug-in with a different unique device instance identifier shall result in the assignment of ordinal numbers which have not been reserved. Replacement of the "known" plug-in after its removal shall result in the re-assignment of the same reserved ordinal number to the plug-in that it formerly had. If the DOR system cannot distinguish individual instances of a module, it may treat modules that are functionally equivalent as though they were the same module for the purposes of the above scheme.

A.1 ISO/IEEE Nomenclature mapping to HL7 OBX-3

The ISO/IEEE Nomenclature provides an unambiguous coding which is mapped to HL7 OBX-3 as follows:

HL7 OBX-3 is of type CWE consisting of:

Table A.1-1: HL7 Component Table - CWE - Coded With Exceptions

SEQ	LEN	DT	Usage	Card.	TBL #	Component Name	Comments	Sec Ref
1	20	ST	R	[1..1]		Identifier	Nomenclature Code	2.A.74
2	199	ST	R	[1..1]		Text	Reference ID	2.A.74
3	20	ID	R	[1..1]	0396	Name of Coding System	"MDC"	2.A.35
4	20	ST	RE	[0..1]		Alternate Identifier		2.A.74
5	199	ST	RE	[0..1]		Alternate Text		2.A.74
6	20	ID	RE	[0..1]	0396	Name of Alternate Coding System		2.A.35
7	10	ST	X	[0..0]		Coding System Version ID		2.A.74
8	10	ST	X	[0..0]		Alternate Coding System Version ID		2.A.74
9	199	ST	X	[0..0]		Original Text		2.A.74

Definition: This data type transmits codes and the text associated with the code.

Maximum Length: 705

Where:

Nomenclature Code is the string representation of the decimal value corresponding to the context free 32 bit representation of the Nomenclature Code

[context-free] Nomenclature Code = (Code Block number * 2**16) + [context-sensitive], where [context-sensitive] is an offset, reflecting a particular variant of an associated "discriminator". The Reference ID is also modified to reflect the variant.

For example, for the "Device Type" Nomenclature, the Device Type discriminator is as follows:

Ref ID variant	Description	Term Code Offset
DEV	Not otherwise specified	0
MDS	Medical Device System	1
VMD	Virtual Medical Device	2
CHAN	Channel	3

Nomenclature codes are obtained from IEEE-11073-10101 Medical Device Communications – Nomenclature where available. Additional codes that are not yet standardized are contained in the Rosetta Terminology Mapping (see IHE PCD Technical Framework Volume 3).

The context-free nomenclature code for a term in code block number 1 whose term code=4104 is equal to ((1 * 2**16) + 4104) = 1*65536 + 4104 = 69640 (which uniquely identifies the SpO2 monitor term) with a Reference ID of MDC_DEV_ANALY_SAT_O2. The context-sensitive form for the variant "MDS" is "MDC_DEV_ANALY_SAT_O2_MDS (appending the suffix

"MDS"), and the Term Code is 69640+1 = 69641 (adding the Term Code Offset to the base Term Code).

The OBX-3 representation is “69641^MDC_DEV_ANALY_SAT_O2_MDS^MDC"

The Virtual Medical Device variants are: MDC_DEV_ANALY_SAT_O2_VMD 69640, and "69642^ MDC_DEV_ANALY_SAT_O2_VMD^MDC" in OBX-3 representation.

To distinguish between periodic and aperiodic data, map from the IEEE 11073 Metric Access to HL7 and code in OBX-17. This is used where you want to distinguish periodic, aperiodic etc. Metric Category also provides distinction between manual and automatic.

Examples of device data (as opposed to patient data) that may be included to allow a receiving system to have a better record of the nature and status of a device are:

MDC_ATTR_SYS_TYPE is used to describe the type of the PCD such as monitor, ventilator, infusion pump, and shall be mapped at the MDS level in the OBX with the value described by OBX-3.

MDC_ATTR_ID_MODEL is used to provide device vendor/model and shall be mapped at the MDS level in the OBX with the value described by OBX-3.

The unique identification of the particular instance of the device is put in OBX-18.

MDC_ATTR_VMS_MDS_STAT describes states - disconnected, configuring, operating, terminating, disassociated, reconfiguring.

For PCDs with complex operation states such as an infusion pump with a set of states like "Stopped", "Infusing Primary", "Infusing Secondary", "Bolus", etc., or a ventilator with states "Standby", "Ventilating", etc., the Device Operational Status Enumeration Object is mapped to OBX-3.

See the Rosetta Terminology Mapping documents referenced in Appendix K for further examples of device data.

Appendix B Common Segment Descriptions

B.1 MSH – Message Header Segment

See HL7 v2.6: chapter 2 (2.14.9)

This segment defines the intent, source, destination, and some specifics of the syntax of a message.

Table B.1-1: MSH - Message Header

SEQ	LEN	DT	Usage	Card.	TBL#	Element name
1	1	ST	R	[1..1]		Field Separator
2	4	ST	R	[1..1]		Encoding Characters
3	227	HD	R	[1..1]	0361	Sending Application
4	227	HD	RE	[0..1]	0362	Sending Facility
5	227	HD	RE	[0..1]	0361	Receiving Application
6	227	HD	RE	[0..1]	0362	Receiving Facility
7	24	DTM	R	[1..1]		Date/Time of Message
8	40	ST	X	[0..0]		Security
9	15	MSG	R	[1..1]		Message Type
10	199	ST	R	[1..1]		Message Control Id
11	3	PT	R	[1..1]		Processing Id
12	60	VID	R	[1..1]		Version ID
13	15	NM	RE	[10..1]		Sequence Number
14	180	ST	X	[0..0]		Continuation Pointer
15	2	ID	R	[1..1]	0155	Accept Acknowledgement Type
16	2	ID	R	[1..1]	0155	Application Acknowledgement Type
17	3	ID	RE	[0..1]	0399	Country Code
18	16	ID	RE	[0..1]	0211	Character Set
19	705	CWE	RE	[0..1]		Principal Language of Message
20	20	ID	X	[0..0]	0356	Alternate Character Set Handling Scheme
21	427	EI	C	[1..1]		Message Profile Identifier
22	567	XON	X	[0..0]		Sending Responsible Organization
23	567	XON	X	[0..0]		Receiving Responsible Organization
24	227	HD	X	[0..0]		Sending Network Address
25	227	HD	X	[0..0]		Receiving Network Address

MSH-1 Field Separator

The IHE PCD Technical Framework requires that applications support HL7-recommended value that is | (ASCII 124).

MSH-2 Encoding Characters

This field contains the four characters in the following order: the component separator, repetition separator, escape character, and subcomponent separator. The IHE PCD Technical Framework requires that applications support HL7-recommended values ^~\& (ASCII 94, 126, 92, and 38, respectively).

MSH-3 Sending Application (HD)

```
Components: <Namespace ID (IS)> ^ <Universal ID (ST)> ^ <Universal ID Type (ID)>
```

The intention of this field is to uniquely identify the software application implementing the PCD actor sending this message. For valid methods of accomplishing this, see Hierarchic Designator (HD) Data Type, Appendix Section C.6 .

MSH-4 Sending Facility

```
Components: <Namespace ID (IS)> ^ <Universal ID (ST)> ^ <Universal ID Type (ID)>
```

For the IHE PCD Technical Framework, when populated, this field shall be implemented as:

First component (required): Namespace ID. The name of the organizational entity responsible for the DOR, typically the provider institution or department operating the DOR.

Second component (optional): The Universal ID (see HL7 v. 2.7 Ch. 2) of the organizational entity responsible for the DOR.

Third component (optional): The Universal ID Type. The codification of these three components is entirely site-defined. It may be detailed in the national extensions of this framework.

MSH-5 Receiving Application (HD)

```
Components: <Namespace ID (IS)> ^ <Universal ID (ST)> ^ <Universal ID Type (ID)>
```

For the IHE PCD Technical Framework, when populated, this field shall be implemented as:

First component (required): Namespace ID. The name of the organizational entity responsible for the receiving application.

Second component (optional): The Universal ID (see HL7 v. 2.7 Ch. 2) of the organizational entity responsible for the receiving application.

Third component (optional): The Universal ID Type. The codification of these three components is entirely site-defined. It may be detailed in the national extensions of this framework.

This field is not required for IHE PCD compliance, but should be populated at the option of the organization operating the system if the field serves a desired function, such as facilitating the routing of messages.

MSH-6 Receiving Facility

```
Components: <Namespace ID (IS)> ^ <Universal ID (ST)> ^ <Universal ID Type (ID)>
```

For the IHE PCD Technical Framework, when populated, this field shall be implemented as:

First component (required): Namespace ID. The name of the organizational entity responsible for the receiving facility.

Second component (optional): The Universal ID (see HL7 v. 2.7 Ch. 2) of the organizational entity responsible for the receiving facility.

Third component (optional): The Universal ID Type. The codification of these three components is entirely site-defined. It may be detailed in the national extensions of this framework.

MSH-7 Date/Time of Message:

The IHE PCD TF requires this field be populated with:

Format: YYYY[MM[DD[HH[MM[SS]]]]]+/-ZZZZ

Time zone qualification of the date/time is required.

MSH-7 shall be used only to provide message created time

MSH-9 Message Type

```
Components: <Message Code (ID)> ^ <Trigger Event (ID)> ^ <Message Structure (ID)>
```

Definition: This field contains the message type, trigger event, and the message structure ID for the message. All three components are required.

Its content is defined within each transaction-specific section of this document.

For PCD-01, this field must contain ORU^R01^ORU_R01.

The PCD PIV profile requires that this field be valued as follows:

- RGV^O15^RGV_O15 for the IOP to IOC message that initiates the PCD-03 transaction
- ACK^O15^ACK for the IOC to IOP accept acknowledgment message
- RRG^O16^RRG_O16 for the IOC to IOP application acknowledgment message
- ACK^O16^ACK for the IOP to IOC acknowledgment of the IOC to IOP application acknowledgment message

MSH-10 Message Control Id

Definition: This field contains a number or other identifier that uniquely identifies the message. Each message should be given a unique identifier by the sending system. The receiving system shall echo this ID back to the sending system in the Message Acknowledgment segment (MSA). The combination of this identifier and the name of the sending application (MSH-3) shall be unique across the Healthcare Enterprise.

MSH-11 Processing ID:

```
Components: <Processing ID (ID)> ^ <Processing Mode (ID)>
```

Definition: This data type indicates whether to process a message as defined in HL7 Application (level 7) processing rules.

The IHE PCD-TF requires the first component Processing ID be valued based on HL7 Table 0103. Use of the second component Processing Mode is optional but if used is based on HL7 Table 0207.

The value in production systems should be P (Production). When it is desired to recognize and isolate test data, the value D (Debugging) may be used.

MSH-12 Version ID

```
Components: <Version ID (ID)> ^ <Internationalization Code (CWE)> ^ <International
            Version ID (CWE)>
```

Definition: This field is matched by the receiving system to its own version to be sure the message will be interpreted correctly.

The PCD TF is based on HL7 V2.6. Where specific elements of later versions are required they have been used and their usage flagged.

Although HL7 allows international affiliate versions to be specified the IHE PCD-TF uses only the core version (first component of the field).

MSH-13 Sequence Number (ID), required but may be empty:

Definition: A non-null value in this field implies that the sequence number protocol is in use. The sequence number protocol is not used in IHE PCD.

MSH-15 Accept Acknowledgement Type

Definition: This field identifies the conditions under which accept acknowledgments are required to be returned in response to this message. Required. Refer to HL7 Table 0155 - Accept/application acknowledgment conditions for valid values. The receiving system must send (or not send) acknowledgements as specified by this field.

In PCD-01 transactions, this field shall be valued as AL.

In PCD-03 transactions, see Section 3.3.4.4.1

MSH-16 Application Acknowledgement Type

Definition: This field identifies the conditions under which application acknowledgments are required to be returned in response to this message. Required for enhanced acknowledgment mode. Refer to HL7 Table 0155 - Accept/application acknowledgment conditions for valid values. The PCD TF requires that this field be valued as NE for PCD-01. Note that the combination of MSH-16 valued as NE and MSH-15 valued as AL is consistent with the original acknowledgement rules used in other IHE TFs. The receiving system must send (or not send) acknowledgements as specified by this field.

For PCD-03 transactions, see section 3.3.4.4.1

MSH-17 Country Code

Definition: This field contains the country of origin for the message. It will be used primarily to specify default elements, such as currency denominations. The values to be used are those of ISO 3166. The ISO 3166 table has three separate forms of the country code: HL7 specifies that the 3-character (alphabetic) form be used for the country code.

MSH-18 Character Set (ID)

Definition: This field contains the character set for the entire message. Refer to HL7 Table 0211 - Alternate character sets for valid values.

An HL7 message uses field MSH-18-character set to specify the character set(s) in use. Valid values for this field are specified in HL7 Table 0211, "Alternate Character Sets". MSH-18-character set may be left blank, or may contain a single value. If the field is left blank, the character set in use is understood to be the 7-bit ASCII set, decimal 0 through decimal 127 (hex 00 through hex 7F). This default value may also be explicitly specified as ASCII.

Any encoding system, single-byte or multi-byte, may be specified as the default character encoding in MSH-18-character set. If the default encoding is other than 7-bit ASCII, sites shall document this usage in the dynamic conformance profile or other implementation agreement. This is particularly effective in promoting interoperability between nations belonging to different

HL7 Affiliates, while limiting the amount of testing required to determine the encoding of a message.

See HL7 V2.6 for the semantics for alphabetic languages other than English (2.15.9.18.1) and for non-alphabetic languages (2.15.9.18.2)

The PCD TF requires this field to be valued if the character set is other than ASCII. If the character set is ASCII the field may be null or have the value of ASCII. A single character set is required for a given message.

MSH-19 Principal Language of Message

```
Components: <Identifier (ST)> ^ <Text (ST)> ^ <Name of Coding System (ID)> ^<Alternate
            Identifier (ST)> ^ <Alternate Text (ST)> ^ <Name of Alternate Coding
            System (ID)>
```

Definition: This field contains the principal language of the message. Codes come from ISO 639.

The PCD uses a default of en^English^ISO639 if the field is empty.

MSH-21 Message Profile Identifier

```
Components: <Entity Identifier (ST)> ^ <Namespace ID (IS)> ^ <Universal ID (ST)>
            ^<Universal ID Type (ID)>
```

For PCD TF, this field is required in non-ACK messages to allow identification of a specific message profile, particularly for testing purposes (it is superfluous and therefore not required in ACK messages). PCD message profiles are assigned ISO OIDs by the PCD Technical Committee and the appropriate Message Profile Identifiers are to be used here in conformant messages. When multiple message profiles are listed in this field they should be (vendor specific, country specific) constraints of the PCD Profile. Note that the overriding of PCD Profile constraints is only allowed in national extensions to this framework.

Assigned OIDs for PCD messages (note that for convenience of reference this table includes OIDs for some messages that are not yet in Final Text status and are therefore not described in this Final Text Technical Framework document):

Assigned OID	PCD Message
1.3.6.1.4.1.19376.1.6.1.1.1	Device to Enterprise Communications PCD-01 Communicate PCD Data message (also used for observations in response to a PCD-02 PCD Data Query)
1.3.6.1.4.1.19376.1.6.1.2.1	Device to Enterprise Communications PCD-02 PCD Data Query
1.3.6.1.4.1.19376.1.6.1.3.1	Point-of-care Infusion Verification PCD-03 Communicate Infusion Order message
1.3.6.1.4.1.19376.1.6.1.3.2	Point-of-care Infusion Verification RRG^O16^RRG_O16 Pharmacy/Treatment Give Acknowledgment Message
1.3.6.1.4.1.19376.1.6.1.4.1	Alarm Communications Management PCD-04
1.3.6.1.4.1.19376.1.6.1.5.1	Alarm Communications Management PCD-05
1.3.6.1.4.1.19376.1.6.1.6.1	Alarm Communications Management PCD-06
1.3.6.1.4.1.19376.1.6.1.7.1	Alarm Communications Management PCD-07
1.3.6.1.4.1.19376.1.6.1.8.1	Alarm Communications Management PCD-08
1.3.6.1.4.1.19376.1.6.1.9.1	Implantable Device - Cardiac Communicate IDC Observations

The ISO OID in the table should be used as the universal ID (EI-3). The Universal ID Type (EI-4) for ISO OIDs is “ISO”. In IHE PCD profiles, the Entity Identifier (EI-1) is optional and may

contain a human-readable name for the profile in the form “IHE_PCD_XXX” where XXX identifies the IHE PCD transaction, for example, IHE_PCD_001 for PCD-01. Namespace Identifier (EI-2) is also optional, but may contain “IHE PCD” to identify the source of the profile for a human reader. It is emphasized that these suggested values are only for human readability and shall play no role in processing. Processing which depends on the Message profile identifier in the receiving application or in a test system shall base its recognition of the profile solely on the ISO OID (Universal ID, EI-3).

Example: IHE_PCD_001^IHE PCD^1.3.6.1.4.1.19376.1.6.1.1.1^ISO

B.1.1 MSH-21 in ACM Messages (PCD-04, PCD-06, PCD-07)

The following table contains the message profile identification values to be used in the ACM messages (PCD-04, PCD-06, PCD-07).

Transactions	MSH-21.1 Entity Identifier	MSH-21.2 Namespace ID	MSH-21.3 Universal ID (the OID)	MSH-21.4 Universal ID Type
Report Alert [PCD-04]	IHE_PCD_ACM_001	IHE PCD	1.3.6.1.4.1.19376.1.6.4.4	ISO
Disseminate Alert [PCD-06]	IHE_PCD_ACM_003	IHE PCD	1.3.6.1.4.1.19376.1.6.4.6	ISO
Report Alert Dissemination Status [PCD-07]	IHE_PCD_ACM_004	IHE PCD	1.3.6.1.4.1.19376.1.6.4.7	ISO

B.2 MSA – Message Acknowledgement Segment

See HL7 v2.6: chapter 2 (2.14.8)

This segment contains information sent while acknowledging another message.

Table B.2-1: MSA - Message Acknowledgement

SEQ	LEN	DT	Usage	Card.	TBL#	Element name
1	2	ID	R	[1..1]	0008	Acknowledgement code
2	20	ST	R	[1..1]		Message Control Id
3	80	ST	X	[0..0]		Text Message
5	1	ID	X	[0..0]		Delayed Acknowledgment Type
6	705	CWE	X	[0..0]	0357	Error Condition

MSA-1 Acknowledgment Code

This field indicates the result of the processing of the message it is acknowledging.

Table B.2-2: HL7 table 0008 - Acknowledgement code

Value	Description	Comment
CA	Enhanced mode: Accept acknowledgment: Commit Accept	The message has been reviewed and accepted.
CE	Enhanced mode: Accept acknowledgment: Error	The message has been rejected for an error.
CR	Enhanced mode: Accept acknowledgment: Commit Reject	The message has been rejected by the receiving system
AA	Original mode Application Acknowledgment:Accept. Enhanced mode: Application acknowledgement: Accept	The receiving system accepted and integrated the message.
AR	Original mode Application Acknowledgment:Reject. Enhanced mode: Application acknowledgement: Reject	The receiving system rejected the message
AE	Original mode Application Acknowledgment: Error. Enhanced mode: Application acknowledgement: Error	The receiving system rejected the message for an error.

1690

MSA-2 Message Control ID

Definition: This field contains the message control ID from the MSH-10 - Message Control ID of the incoming message for which the acknowledgement is sent.

MSA-3 Text Message

1695 See the ERR segment.

B.3 ERR – Error Segment

HL7 v2.6, Chapter 2 (2.14.5)
This segment is used to add error comments to acknowledgment messages.

1700 **Table B.3-1: ERR - Error segment**

SEQ	LEN	DT	Usage	Card.	TBL #	Element name
1	493	ELD	B	[0..1]		Error Code and Location
3	705	CWE	R	[1..1]	0357	HL7 Error Code
4	2	ID	R	[1..1]	0516	Severity
5	705	CWE	RE		0533	Application Error Code
6	80	ST	C			Application Error Parameter

Notes: ERR-1 is included in HL7 v2.6 for backward compatibility only. Within the context of IHE PCD, this field shall not be used.

ERR-3 and ERR-4 are required by HL7 v2.6

1705 **ERR-5 Application Error Code**

Application specific codes for infusion-related errors resulting from a PCD-03 transaction, identifying the specific error that occurred, are given in the IHE PCD Application Error Table– the IHE PCD website should be consulted for the latest approved table (http://wiki.ihe.net/index.php?title=PumpErrorCodes).

1710 **ERR-6 Application Error Parameter**

Additional information to be used with application specific codes calling for the input of Parameter names or values as called for in the IHE PCD Application Error Table.

B.4 NTE - Notes and Comment Segment

1715 HL7 v2.6 : chapter 2 (2.4.10)
This segment is used for sending notes and comments.
The IHE PCD Technical Framework limits the use of this segment to only one purpose: to comment the observations and the orders. Therefore, in the messages of this Integration Profile, NTE segments appear only following either OBR or OBX segments.
1720 Information that can be coded in OBX segments or OBR segments shall not be sent in a NTE segment.
Detail of the fields used by the NTE segment in the PCD Observation Message is given below.

Table B.4-1: NTE - Notes and Comment segment

SEQ	LEN	DT	Usage	Card.	TBL#	Element name
1	4	SI	R	[1..1]		Set ID – NTE
2	8	ID	X	[0..0]		Source of Comment
3	65536	FT	RE	[0..1]		Comment
4	705	CWE	X	[0..0]		Comment Type
5	3220	XCN	X	[0..0]		Entered by
6	24	DTM	X	[0..0]		Entered Date/Time
7	24	DTM	X	[0..0]		Expiration Date

1725

NTE-1 Set ID

This field may be used where multiple NTE segments are used in a message. Their numbering must be described in the application message definition.

NTE-3 Comment

1730 This field contains the text of the comment. This text may be formatted. In order to delete an existing comment, the field shall contain empty quotation marks: "".

Comment text of identical type and source shall be included in the same occurrence of an NTE segment, and not be split over multiple segments.

B.4.1 NTE Notes and Comment Segment in ACM Transaction PCD-04

For indicated issues not addressed in information normative locations under agreement between the AR and AM actors. Site or system specific indications are optionally passed in this manner to the AM for dispatch decision making or through the AM to the AC to communications endpoints.

Table B.4.1-1: HL7 Attribute Table – NTE – Notes and Comment

SEQ	LEN	DT	OPT	RP/#	TBL#	ELEMENT NAME
3	65536	FT	O	Y		Comment

NTE-3 Comment (FT)

This field contains the comment contained in the segment.

B.5 PID - Patient Identification segment

HL7 v2.6 : chapter 3 (3.4.2)

The PID segment is used by all applications as the primary means of communicating patient identification information. This segment contains permanent patient identifying and demographic information that, for the most part, is not likely to change frequently.

Patient Care Devices or gateway systems providing PCD observation reports are not ordinarily primary interfaces for detailed patient demographic information. Another information system such as a master patient index will generally be the source of authoritative information sent in the PID segment. Getting this data is out of scope for this IHE PCD Technical Framework: IHE Information Technology Infrastructure Technical Framework should be consulted for standards-based means for tracing a feed of ADT events (Patient Identify Feed) or querying this information based on information available at the point of care such as a bar-code scan of a patient identity wristband (Patient Data Query). In the context of the IHE Patient Care domain, this general problem is referred to as Patient Identity Binding and has been the subject of a Technical Framework Supplement in the past. At present, this data requirement is delegated to IHE Information Technology Infrastructure profiles.

Reliable patient identity information is essential for correctly associating Patient Care Device data with the patient, which is obviously critical for safe and effective treatment. Consequently, unique identifiers and additional confirmatory factors such as patient name are listed as required by this profile.

Table B.5-1: PID - Patient Identification segment

SEQ	LEN	DT	Usage	Card.	TBL#	Element name
1	4	SI	X	[0..0]		Set ID - PID
2	20	CX	X	[0..0]		Patient ID
3	250	CX	R	[1..6]		Patient Identifier List
4	20	CX	X	[0..0]		Alternate Patient ID - PID

SEQ	LEN	DT	Usage	Card.	TBL#	Element name
5	250	XPN	R	[1..6]		Patient Name
6	250	XPN	RE	[0..1]		Mother's Maiden Name
7	24	DTM	RE	[0..1]		Date/Time of Birth
8	1	IS	RE	[0..1]	0001	Administrative Sex
9	250	XPN	X	[0..0]		Patient Alias
10	705	CWE	RE	[0..1]	0005	Race
11	250	XAD	RE	[0..1]		Patient Address
12	4	IS	RE	[0..1]	0289	County Code
13	250	XTN	RE	[0..2]		Phone Number - Home
14	250	XTN	X	[0..1]		Phone Number - Business
15	705	CWE	RE	[0..1]	0296	Primary Language
16	705	CWE	RE	[0..1]	0002	Marital Status
17	705	CWE	RE	[0..0]	0006	Religion
18	705	CX	RE	[0..1]		Patient Account Number
19	16	ST	X	[0..1]		SSN Number - Patient
20	25	DLN	RE	[0..1]		Driver's License Number - Patient
21	705	CX	RE	[0..1]		Mother's Identifier
22	705	CWE	RE	[0..1]	0189	Ethnic Group
23	705	ST	RE	[0..1]		Birth Place
24	1	ID	RE	[0..1]	0136	Multiple Birth Indicator
25	2	NM	RE	[0..1]		Birth Order
26	705	CWE	RE	[0..1]	0171	Citizenship
27	705	CWE	RE	[0..1]	0172	Veterans Military Status
28	705	CWE	RE	[0..1]	0212	Nationality
29	24	DTM	RE	[0..1]		Patient Death Date and Time
30	1	ID	RE	[0..1]	0136	Patient Death Indicator
31	1	ID	RE	[0..1]	0136	Identity Unknown Indicator
32	20	IS	RE	[0..1]	0445	Identity Reliability Code
33	24	DTM	RE	[0..1]		Last Update Date/Time
34	241	HD	RE	[0..1]		Last Update Facility
35	705	CWE	RE	[0..1]	0446	Species Code
36	250	CWE	C	[0..0]	0447	Breed Code
37	80	ST	C	[0..1]		Strain
38	705	CWE	RE	[0..2]	0429	Production Class Code
39	705	CWE	RE	[0..1]	0171	Tribal Citizenship

1765 The following describes the IHE PCD usage of those fields which have a usage other than X in the above table and have IHE PCD usage notes added to the general definitions in the HL7 2.6 standard.

PID-3 Patient Identifier List

Definition: This field contains the list of identifiers (one or more) used by the healthcare facility to uniquely identify a patient (e.g., medical record number, billing number, birth registry, national unique individual identifier, etc.). In Canada, the Canadian Provincial Healthcare Number is used in this field.

Component PID-3.1 (in terms of the CX data type, CX-1) "ID number", is required. PID-3.4 (CX-4) "Assigning authority", and PID-3.5 (CX-5) "Identifier Type Code" are required for each identifier if they are known (for example if they are ordinarily included in ADT messages at the institution), but may be empty if they are not known. See Appendix CX Data Type. Note that PID-3.4 is an Entity Identifier data type, so it may have subcomponents.

The workflow and mechanism by which patient identification is bound to the data from a particular PCD device is outside of the scope of the IHE PCD Framework. Common implementations employ either automated or manual entry based on information provided by an authoritative source of patient identity.

The IHE PCD recognizes that it is critical for data to be associated with the correct patient, thus the general rule that at least PID-3 and PID-5 be available for at least two-factor patient identification, but that there are also situations like emergency admissions where it may be desirable to collect data before an authoritative patient identification is available, for later association with the patient's other data. Only after appropriate study, risk analysis, and defined risk mitigation measures determined by the provider institution in consultation with the manufacturers of the systems involved, a defined method for deferred association of patient data could be designed. In such a case, these fields, instead of being populated with authoritative patient identity information, could be populated with agreed-on special values (like an automatically generated "stat admit" patient identifier and a well-known special value in PID-5 indicating the temporary situation) pending the later human-validated merging of the data.

The IHE PCD recognizes that for some use cases, such as medication administration, additional identification information or other patient demographic information is required in addition to an organizationally assigned unique identifier. Patient name, date of birth, gender, and other information are commonly used to provide the additional patient identification context for these use cases. Additional patient demographic information is provided by the fields of the PID segment and the patient location, which is often a key element in PCD communications, is provided in the PV1-3 element.

PID-5 Patient Name

Definition: This field contains the names of the patient; the primary or legal name of the patient is reported first. Therefore, the name type code in this field should be "L - Legal" if such a name is available. If no name is available, the name type code should be "U – unspecified", and the other components should be empty. All other codes in HL7 Table 0200 – Name Type are also acceptable. Note that "last name prefix" is synonymous to "own family name prefix" of previous versions of HL7, as is "second and further given names or initials thereof" to "middle initial or name". Multiple given names and/or initials are separated by spaces.

The workflow and mechanism by which patient name is bound to the data from a particular PCD device is outside of the scope of this version of the IHE PCD Framework. Common implementations employ either automated or manual entry based on information provided by an authoritative source of patient identity. The workflow and transactions to bind patient name are

included on the IHE PCD Roadmap for consideration in future versions of the IHE PCD Framework.

See Appendix C.8 XPN Type for further information.

PID-6 Mother's Maiden Name

Definition: This field contains the family name under which the mother was born (i.e., before marriage). It is used to distinguish between patients with the same last name.

See Appendix C.8 XPN Type for further information.

PID-7 Date/Time of Birth

For the IHE PCD Technical Framework, when populated, this field shall be implemented as:

Format: YYYY[MM[DD[HH[MM[SS]]]]][+/-ZZZZ]

See Appendix C.4, DTM – date/time for further information.

PID-8 Administrative Sex

Definition: This field contains the patient's sex. Refer to HL7 User-defined Table 0001 - Administrative Sex for suggested values.

Table B.5-2: HL7 User-defined Table 0001 - Administrative Sex

Value	Description	Comment
F	Female	
M	Male	
O	Other	
A	Ambiguous	
N	Not applicable	

PID-10 Race (CWE)

Definition: This field refers to the patient's race. Refer to User-defined Table 0005 - Race for suggested values. The second triplet of the CWE data type for race (alternate identifier, alternate text, and name of alternate coding system) is reserved for governmentally assigned codes.

Table B.5-3: HL7 User-defined Table 0005 - Race

Value	Description	Comment
1002-5	American Indian of Alaska Native	
2028-9	Asian	
2054-5	Black or African American	
2076-8	Native Hawaiian of Other Pacific Islander	
2106-3	White	
2131-1	Other Race	

PID-11 Patient Address


```
Components: <Street Address (SAD)> ^ <Other Designation (ST)> ^ <City (ST)> ^ <State
            or Province (ST)> ^ <Zip or Postal Code (ST)> ^ <Country (ID)> ^ <Address
            Type (ID)> ^ <Other Geographic Designation (ST)> ^ <County/Parish Code
            (IS)> ^ <Census Tract (IS)> ^ <Address Representation Code (ID)> ^
            <Address Validity Range (DR)> ^ <Effective Date (DTM)> ^ <Expiration Date
            (DTM)>

Subcomponents for Street Address (SAD): <Street or Mailing Address (ST)> & <Street
            Name (ST)> & <Dwelling Number (ST)>

Subcomponents for Address Validity Range (DR): <Range Start Date/Time (DTM)> & <Range
            End Date/Time (DTM)>

Subcomponents for Range Start Date/Time (DTM): <Time (DTM)> & <Degree of Precision
            (ID)>

Subcomponents for Range End Date/Time (DTM): <Time (DTM)> & <Degree of Precision (ID)>

Subcomponents for Effective Date (DTM): <Time (DTM)> & <Degree of Precision (ID)>

Subcomponents for Expiration Date (DTM): <Time (DTM)> & <Degree of Precision (ID)>
```

Definition: This field contains the mailing address of the patient. Address type codes are defined by HL7 Table 0190 - Address Type. The PCD only requires the first, third, fourth, and fifth components to be valued with the mailing address and the Address Type to be valued as M.

PID-13 Phone Number – Home

Definition: This field contains the patient's personal phone numbers. This data type is usually in a repeatable field, to allow a list of numbers. The PCD requires the sequence to be the primary number (for backward compatibility). The PCD constrains this field to 2 repetitions to allow for a phone number and an email address.

See Appendix XTN Data Type for further information.

PID-15 Primary Language

See HL7 V2.6 Section 3.4.2.15 for details. The PCD TF requires the use of ISO639 for the codes.

PID-16 Marital Status

See HL7 V2.6 Section 3.4.2.16 for details. The PCD TF does not further constrain this field.

PID-17 Religion

See HL7 V2.6 Section 3.4.2.17 for details. The PCD TF does not further constrain this field.

PID-18 Patient Account Number

See HL7 V2.6 Section 3.4.2.18 for details. The PCD TF does not further constrain this field. Additional requirements may be documented in Regional or National appendices to the IHE PCD Technical Framework.

PID-20 Driver's License Number – Patient

See HL7 V2.6 Section 3.4.2.20 for details. The PCD TF does not further constrain this field.

PID-21 Mother's Identifier

See HL7 V2.6 Section 3.4.2.21 for details. The PCD TF does not further constrain this field.

PID-22 Ethnic Group:

See HL7 V2.6 Section 3.4.2.22 for details. The PCD TF does not further constrain this field.

PID-23 Birth Place

See HL7 V2.6 Section 3.4.2.23 for details. The PCD TF does not further constrain this field.

PID-24 Multiple Birth Indicator

See HL7 V2.6 Section 3.4.2.24 for details. The PCD TF does not further constrain this field.

PID-25 Birth Order

See HL7 V2.6 Section 3.4.2.25 for details. The PCD TF does not further constrain this field.

PID-26 Citizenship

See HL7 V2.6 Section 3.4.2.26 for details. The PCD TF does not further constrain this field.

PID-27 Veterans Military Status

See HL7 V2.6 Section 3.4.2.27 for details. The PCD TF does not further constrain this field.

PID-28 Nationality

See HL7 V2.6 Section 3.4.2.28 for details. The PCD TF does not further constrain this field.

PID-29 Patient Death Date and Time

Definition: This field contains the date and time at which the patient death occurred.

See Appendix DTM – date/time for PCD constraints.

PID-30 Patient Death Indicator

See HL7 V2.6 Section 3.4.2.30 for details. The PCD TF does not further constrain this field.

PID-31 Identity Unknown Indicator

See HL7 V2.6 Section 3.4.2.31 for details. The PCD TF does not further constrain this field.

PID-32 Identity Reliability Code

See HL7 V2.6 Section 3.4.2.32 for details. The PCD TF does not further constrain this field.

PID-33 Last Update Date/Time

Definition: This field contains the last update date and time for the patient's/person's identifying and demographic data, as defined in the PID segment. Receiving systems will use this field to determine how to apply the transaction to their systems. If the receiving system (such as an enterprise master patient index) already has a record for the person with a later last update date/time, then the EMPI receiving system could decide not to apply the patient's/person's demographic and identifying data from this transaction.

See Appendix DTM – date/time for PCD constraints.

PID-34 Last Update Facility

See HL7 V2.6 Section 3.4.2.34 for details. The PCD TF does not further constrain this field.

PID-35 Species Code

See HL7 V2.6 Section 3.4.2.35 for details. The PCD TF does not further constrain this field.

PID-36 Breed Code

See HL7 V2.6 Section 3.4.2.36 for details. The PCD TF does not further constrain this field.

PID-37 Strain

See HL7 V2.6 Section 3.4.2.37 for details. The PCD TF does not further constrain this field.

PID-38 Production Class Code

See HL7 V2.6 Section 3.4.2.38 for details. The PCD TF does not further constrain this field.

PID-39 Tribal Citizenship (CWE)

See HL7 V2.6 Section 3.4.2.39 for details. The PCD TF does not further constrain this field.

B.5.1 PID Segment requirements for ACM Transaction PCD-04

This segment is required to be present and is populated with data used to identify the patient associated with the alert in the case where the identity is available from the Alert Source system. If the patient identification is not available from the Alert Source system, the alert may be location source based per ACM use case A1 in which case the PV1 segment identifies the location associated with the alert. Additional information may be present to more unambiguously identify the patient.

Table B.5.1-1: HL7 Attribute Table – PID – Patient Identification

SEQ	LEN	DT	OPT	RP/#	TBL#	ELEMENT NAME
3	250	CX	O	Y		Patient Identifier List
5	250	XPN	O	Y		Patient name
7	26	TSO	O			Date/Time of Birth
8	1	IS	O			Administrative Sex

PID-3 Patient Identifier List (CX)

This information may be used by the AM actor in the message sent to the AC actor to identify the patient associated with the alert within site specific HIPAA and electronic patient healthcare information policies.

PID-5 Patient Name (XPN)

This information may be used by the AM actor in the message sent to the AC actor to identify the patient associated with the alert within site specific HIPAA and electronic patient healthcare information policies. Refer to PID-31 Identity Unknown Indicator for the means to identify that while a PID segment is provided the identity of the patient is unknown.

PID-7 Date/Time of Birth (TSO)

This information may be used by the AM actor in the message sent to the AC actor to identify the patient associated with the alert within site specific HIPAA and electronic patient healthcare information policies.

PID-8 Administrative Sex (IS)

This information may be used by the AM actor in the message sent to the AC actor to identify the patient associated with the alert within site specific HIPAA and electronic patient healthcare information policies.

PID-31 Identity Unknown Indicator (ID)

Definition: This field indicates whether or not the patient's/person's identity is known. Refer to HL7 Table 0136 - Yes/No Indicator for valid values.

Y the patient's/person's identity is unknown

N the patient's/person's identity is known

B.6 PV1 - Patient Visit Segment

See HL7 V2.6 Section 3.4.3 for details.

The PV1 segment is used by Registration/Patient Administration applications to communicate information on an account or visit-specific basis. The default is to send account level data. To use this segment for visit level data PV1-51 - Visit Indicator must be valued to 'V'. The value of PV-51 affects the level of data being sent on the PV1, PV2, and any other segments that are part of the associated PV1 hierarchy (e.g., ROL, DG1, or OBX).

The facility ID, the optional fourth component of each patient location field, is a HD data type that is uniquely associated with the healthcare facility containing the location. A given institution, or group of intercommunicating institutions, should establish a list of facilities that may be potential assignors of patient locations. The list will be one of the institution's master dictionary lists. Since third parties other than the assignors of patient locations may send or receive HL7 messages containing patient locations, the facility ID in the patient location may not be the same as that implied by the sending and receiving systems identified in the MSH. The facility ID must be unique across facilities at a given site. This field is required for HL7 implementations that have more than a single healthcare facility with bed locations, since the same <point of care> ^ <room> ^ <bed> combination may exist at more than one facility.

Details of the PV1 segment as used in the IHE PCD Technical Framework are given in Table B.6-1: HL7 Attribute Table - PV1 - Patient Visit.

Table B.6-1: HL7 Attribute Table - PV1 - Patient Visit

SEQ	LEN	DT	Usage	Card.	TBL#	Element name
1	4	SI	X	[0..0]		Set ID - PV1
2	1	IS	R	[1..1]	0004	Patient Class

SEQ	LEN	DT	Usage	Card.	TBL#	Element name
3	80	PL	RE	[0..1]		Assigned Patient Location
4	2	IS	X	[0..0]	0007	Admission Type
5	250	CX	X	[0..0]		Preadmit Number
6	80	PL	X	[0..0]		Prior Patient Location
7	250	XCN	X	[0..0]	0010	Attending Doctor
8	250	XCN	X	[0..0]	0010	Referring Doctor
9	250	XCN	X	[0..0]	0010	Consulting Doctor
10	3	IS	X	[0..0]	0069	Hospital Service
11	80	PL	X	[0..0]		Temporary Location
12	2	IS	X	[0..0]	0087	Preadmit Test Indicator
13	2	IS	X	[0..0]	0092	Re-admission Indicator
14	6	IS	X	[0..0]	0023	Admit Source
15	2	IS	X	[0..0]	0009	Ambulatory Status
16	2	IS	X	[0..0]	0099	VIP Indicator
17	250	XCN	X	[0..0]	0010	Admitting Doctor
18	2	IS	X	[0..0]	0018	Patient Type
19	250	CX	RE	[0..1]		Visit Number
20	50	FC	X	[0..0]	0064	Financial Class
21	2	IS	X	[0..0]	0032	Charge Price Indicator
22	2	IS	X	[0..0]	0045	Courtesy Code
23	2	IS	X	[0..0]	0046	Credit Rating
24	2	IS	X	[0..0]	0044	Contract Code
25	8	DT	X	[0..0]		Contract Effective Date
26	12	NM	X	[0..0]		Contract Amount
27	3	NM	X	[0..0]		Contract Period
28	2	IS	X	[0..0]	0073	Interest Code
29	4	IS	X	[0..0]	0110	Transfer to Bad Debt Code
30	8	DT	X	[0..0]		Transfer to Bad Debt Date
31	10	IS	X	[0..0]	0021	Bad Debt Agency Code
32	12	NM	X	[0..0]		Bad Debt Transfer Amount
33	12	NM	X	[0..0]		Bad Debt Recovery Amount
34	1	IS	X	[0..0]	0111	Delete Account Indicator
35	8	DT	X	[0..0]		Delete Account Date
36	3	IS	X	[0..0]	0112	Discharge Disposition
37	47	DLD	X	[0..0]	0113	Discharged to Location
38	705	CwE	X	[0..0]	0114	Diet Type
39	2	IS	X	[0..0]	0115	Servicing Facility
40	1	IS	X	[0..0]	0116	Bed Status
41	2	IS	X	[0..0]	0117	Account Status
42	80	PL	X	[0..0]		Pending Location
43	80	PL	X	[0..0]		Prior Temporary Location

SEQ	LEN	DT	Usage	Card.	TBL#	Element name
44	24	DTM	RE	[0..1]		Admit Date/Time
45	24	DTM	X	[0..0]		Discharge Date/Time
46	12	NM	X	[0..0]		Current Patient Balance
47	12	NM	X	[0..0]		Total Charges
48	12	NM	X	[0..0]		Total Adjustments
49	12	NM	X	[0..0]		Total Payments
50	250	CX	X	[0..1]	0203	Alternate Visit ID
51	1	IS	RE	[0..1]	0326	Visit Indicator

PV1-2 Patient Class

Definition: This field is used by systems to categorize patients by site. It does not have a consistent industry-wide definition. It is subject to site-specific variations. Refer to table B.6-2 HL7User-defined Table 0004 - Patient Class for IHE PCD suggested values.

Table B.6-2: HL7 User-defined Table 0004 - Patient Class

Value	Description	Comment
E	Emergency	
I	Inpatient	
O	Outpatient	
P	Preadmit	
R	Recurring patient	
B	Obstetrics	
U	Unknown	

PV1-3 Assigned Location

IHE PCD definition: This field contains the patient's initial assigned location or the location to which the patient is being moved. The first component may be the nursing station for inpatient locations, or clinic or department, for locations other than inpatient.

For IHE PCD usage see Appendix PL Data Type.

PV1-19 Visit Number

IHE PCD definition: This field contains the unique number assigned to each patient visit.

PV1-44 Admit Time / Date

HL7 Definition: This field contains the admit date/time. It is to be used if the event date/time is different than the admit date and time, i.e., a retroactive update. This field is also used to reflect the date/time of an outpatient/emergency patient registration. IHE PCD does not further constrain this field.

PV1-51 Visit Indicator

HL7 definition: This field specifies the level on which data are being sent. It is the indicator used to send data at two levels, visit and account. IHE PCD implementations shall send an 'A' or no value when the data in the message are at the account level, or 'V' to indicate that the data sent in the message are at the visit level.

The value of this element affects the context of data sent in PV1, PV2 and any associated hierarchical segments (e.g., DB1, AL1, DG1, etc.).

B.6.1 PV1 Patient Visit Segment in ACM Transaction PCD-04

This segment is used to identify a patient location associated with the alert. Real Time Location Services (RTLS) or GPS equipment or personnel location information is not passed in this segment. It is passed from the AR to the AM via an OBX segment.

If the Patient Identification (PID) segment is present in the alert data and it contains an identified patient as in ACM use case A2 resolve patient location from a more contemporary information source than this segment.

Table B.6.1-1: HL7 Attribute Table – PV1 – Patient Visit

SEQ	LEN	DT	OPT	RP/#	TBL#	ELEMENT NAME
3	80	PL	O			Assigned Patient Location

PV1-3 Assigned Patient Location (PL)

This field contains the location associated with the alert. This may not be the current location of the alert related patient. It is typically a location established by an external system such as ADT, as in the patient assigned bed location as used in association with a patient station of a nurse call system.

B.7 OBR – Observation Request segment

In the reporting of clinical data, the Observation Request Segment (OBR) serves as the 'report header' for the ORDER_OBSERVATION segment group, which in its simplest form is an OBR segment followed by a set of OBX segments which represent observations associated with the 'order' represented by the OBR segment. It identifies the observation set represented by the following atomic observations. It includes the relevant ordering information when that applies and many of the attributes that apply to all of the following observations.

Table B.7-1: OBR segment

SEQ	LEN	DT	Usage	Card.	TBL#	Element name
1	4	SI	R	[1..1]		Set ID OBR
2	427	EI	C	[0..1]		Placer Order Number
3	427	EI	R	[1..1]		Filler Order Number
4	705	CWE	R	[1..1]		Universal Service Identifier
5	2	ID	X	[0..0]		Priority - OBR
6	24	DTM	X	[0..0]		Requested Date/Time

SEQ	LEN	DT	Usage	Card.	TBL#	Element name
7	24	DTM	RE	[0..1]		Observation Date/Time
8	24	DTM	RE	[0..1]		Observation End Date / Time
9	722	CQ	X	[0..0]		Collection Volume
10	3220	XCN	R2	[0..1]		Collection Identifier

OBR-1 Set ID OBR

Definition: For the first order transmitted in each message, the sequence number shall be 1; for the second order, it shall be 2; and so on.

OBR-2 Placer Order Number

Definition: This field has the Entity Identifier data type. The first component (EI-1, Entity Identifier) is a string that identifies an individual order (e.g., OBR). It is assigned by the placer (ordering application). It identifies an order uniquely among all orders from a particular ordering application. The second through fourth components contain the application ID of the placing application in the same form as the HD data type. The second component, Namespace ID, is a user-defined coded value that will be uniquely associated with an application. A given institution or group of intercommunicating institutions should establish a unique list of applications that may be potential placers and fillers and assign unique application IDs. The components are separated by component delimiters.

This field is conditionally required as described in HL7, where the placer id may be sent in either the ORC or the OBR segment. If the observation is in response to an order, then the ordering application's placer number and naming system should be returned here. If there is no placer number, for example a "standing" order that is documented as a hospital specific protocol, then the Device Observation Reporter may assign one and send it here as specified in HL7.

The PCD TF requires at a minimum that Entity Identifier (EI-1) and Namespace ID (EI-2) be valued. and recommends that the Namespace Id (EI-2) shall refer to the locally unique application identifier assigned to the Device Observation Reporter application implementing IHE PCD actors which fill the role of an ordering application such as the DOR. In order to avoid conflicting Ids in any context, it is desirable, though not required, that the assigning application be identified according to a Universal ID system by giving a value for Universal ID (EI-3) and Universal ID type (EI-4). If EI-3 and EI-4 are valued, then EI-2 (Namespace ID) is not required.

See Appendix C.5 EI Data Type for further information.

See HL7 V2.6 Section 7.4.1.2 for details. The PCD TF does not further constrain this field.

OBR-3 Filler Order Number

Definition: This field is the order number associated with the filling application. This is a permanent identifier for an order and its associated observations. It is a special case of the Entity Identifier data type. The first component (EI-1, Entity Identifier) is a string that identifies an order detail segment (e.g., OBR). It is assigned by the order filler (receiving) application. This string must uniquely identify the order (as specified in the order detail segment) from other orders in a particular filling application (e.g., patient monitoring gateway). This uniqueness must persist over time. The second through fourth components contain the filler application ID, in the form of the HD data type. The second component (Namespace ID, EI-2) is a user-defined coded value that uniquely defines the application from other applications on the network. The Namespace ID of the filler order number always identifies the actual filler of an order.

The PCD TF requires that the Universal ID (EI-3) be valued with a Unique ID for the application identifier assigned to the application implementing IHE actors supporting the role of an order filler such as the DOR (Device Observation Reporter). The Universal ID Type (EI-4) shall be valued with the appropriate type notation corresponding to the Unique ID. The preferred Universal ID type for IHE PCD is the EUI-64 code. The Universal ID type (EI-4) is then "EUI-64". In cases where an EUI-64 is not available, less preferred Universal IDs for the application may be used as detailed in Appendix C.5 EI Data Type. For compatibility with older receiving systems, the PCD TF recommends that the Entity Identifier (EI-1) be valued with a duplicate of the Universal ID as in EI-3. The Namespace ID (EI-2) is not required but for backward compatibility may be valued with a "legacy" locally unique identifier for the filler application.

OBR-4 Universal Service ID

Definition: This field shall contain the identifier code for the requested observation/test/battery. This can refer to specific existing orders, or nonspecific “standing” orders. “Universal” procedure codes from a code set recognized by HL7 should be used when available. Locally defined codes may be used by agreement where standardized codes are not available.

When reporting events related to "standing" orders, as is common in patient monitoring, these codes may describe a generic service, for example:

Examples of SNOMED CT (HL7 Universal ID Type SCT) terms appropriate for use in this field:

```
266706003^Continuous ECG monitoring^SCT
359772000^glucose monitoring at home^SCT
182777000^monitoring of patient ^SCT
```

In some contexts, the service identifier used in this field may usefully contain information on which the receiving system can base decisions about further processing for the message, including not processing the message if the content is not wanted (e.g., waveform information that the receiving system is not able to use).

Local codes are permissible if no appropriate SNOMED CT term can be used, but users of this Technical Framework who encounter a situation where a new type of service related to patient care devices is identified should submit a description of the service to the PCD Technical Committee so that provisional codes can be defined, and permanent codes requested from an appropriate standards development organization.

An accepted "legacy" usage is for OBR-4 to contain an EUI-64 identification for the sending system. This was required in previous versions of this Technical Framework. This is acceptable as a local code for a "service" that consists of sending the PCD data that the particular system is configured to send and which is understood by the receiving system, by local agreement.

In communications related to infusion orders, the “service” identified by this field is the substance to be administered: when a device generates a PCD-01 message as a result of a PCD-03 request/order, then the requested Give Code from that order should be reflected back in the OBR-4 field. The sender may use an equivalent code for the same requested item. The sender may not use a code that equates to a different item than what was requested. When the PCD-01 is not related to a PCD-03 order, this code should reflect the service being rendered for the patient (i.e., the medication), when known. If a medication has been selected on the pump, the value of the code will relate to the medication as it is defined in the pump’s drug library. As long as the pump drug library is in synch with the receiving system, the value will match the receiving system’s code for the substance being administered. If no medication has been selected on the pump, this field can be populated with a local “unknown medication”

identifier and description. Alternatively, “999999” can be used as the identifier and “Medication Unknown” can be used as the description.

See Appendix A ISO/IEEE 11073 Mapping to HL7 for further details.

See HL7 V2.6 Section 7.4.1.4 for details related to OBR-4

OBR-7 Observation Date/Time

Specifies the time point or start of time interval for all OBX segments within the scope of this OBR segment, that is, OBX segments that are part of the ORDER_OBSERVATION segment group, that do not specify an overriding time point in OBX-14. (The presence of an overriding time point in OBX-14 signals an episodic measurement such as noninvasive blood pressure. The absence of an overriding time point in OBX-14 implies that this is an instance of a periodically sampled observation with a time stamp given by OBR-7. This distinction can also be made explicitly in OBX-17 Observation Method).

OBR-8 Observation End Date/Time

If OBR-8 is not specified, OBR-7 specifies the *default time point* for all OBX segments within its scope that do not specify an overriding time point in OBX-14.

If OBR-7 and OBR-8 are both specified, OBR-7 specifies the mathematically ‘closed’ interval boundary at the start of the time interval and OBR-8 specifies the mathematically ‘open’ end of the time interval. The interval [OBR-7, OBR-8) serves as the *default time interval* for all OBX segments within its scope that do not specify an overriding time point in OBX-14.

A single-valued OBX-5 is assumed to occur at time OBR-7 by default, and a multi-valued OBX-5 containing *N* values is assumed to be divided into *N* equal time sub-intervals, with the *Nth* value occurring at the beginning of each time sub-interval.

The default time interval [OBR-7, OBR-8) is equivalent the HL7 V3 representation where inclusive="true" specifies a ‘closed’ boundary and inclusive="false" specifies an ‘open’ boundary for the ten second interval shown below.

```
<effectiveTime>
   <low value="20100101091820.000" inclusive="true" />
   <high value="20100101091830.000" inclusive="false" />
</effectiveTime>
```

OBR-10 Collector Identifier

When a specimen is required for the study, this field is available to identify the person, department, or facility that collected the specimen. Refer to the HL7 v2.6 specification for details of the XCN data type. IHE PCD does not further constrain this field.

B.7.1 OBR Observation Request Segment in ACM Transaction PCD-04

A Report Alert [PCD-04] transaction contains at most one alert indication.

The OBR segment is used to uniquely identify the alert indication and the descendent alert status update indications.

Table B.7.1-1: HL7 Attribute Table – OBR – Observation Result

SEQ	LEN	DT	OPT	RP/#	TBL#	ELEMENT NAME
2	22	EI	O			Placer Order Number
3	22	EI	R			Filler Order Number
4	705	CWE	R			Universal Service Identifier
7	24	DTM	RE			Observation Date/Time
16	3220	XCN	O	Y		Ordering Provider
17	250	XTN	O	Y/2		Order Callback Phone Number
28	3220	XCN	O	Y		Result Copies To
29	855	EIP	R			Parent

OBR-2 Placer Order Number (EI) 00216

This field identifies an individual order (e.g., OBR) and is the same as ORC-2.

OBR-3 Filler Order Number (EI) 00217

This field serves as the unique identifier for status updates to an alert indication identified in OBR-29 Parent. This value is assigned by the Alert Source and is used by system actors to associate updates to a particular alert identified in OBR-29 Parent.

OBR-4 Universal Service Identifier (CWE) 00238

This field contains the identification of the packaged message content, ALARM^ALARM.

OBR-7 Observation Date/Time (DTM) 00241

This field identifies the point in time at which the Alert Reporter actor committed itself to packaging up the Report Alert transaction information to be sent to the Alert Manager. The alert date and time for initial indications, updates, and endings shall be in the OBX-14 ObservationDate/Time field of the OBX segment identified by the Facet value (1) associated with Event Identification. OBR-8 Observation End Date/Time is not used to indicate the end of an alert since the Alert Report transaction itself is a point in time with zero duration.

OBR-17 Order Callback Phone Number (XTN) 00250

This field is the telephone number for reporting a status or a result using the standard format with extension and/or beeper number when applicable. This can be used to pass the nurse call system patient station telephony call back information to the caregiver. If the structure of the telephony dial string is not known then the call back number should be in the Unformatted Telephone number (ST) component of the field.

OBR-28 Result Copies To (XCN) 00260

This field should not be used in Report Alert [PCD-04] transactions to indicate PIN/Carrier or other recipients for alert dissemination. Instead use the Participant Information (PRT) segment.

OBR-29 Parent (EIP) 00261

This field serves as the unique identifier for the alert indication. It is assigned by the Alert Source and is used by system actors to associate all messages from all actors that pertain to a particular

alert throughout the history of the alert. So the same value of OBR-29 will be sent by the Alert Source in the messages concerning the start, end, continuation of the alert, and will also be used in status messages from other actors concerning that alert. It may consist of a unique identifier of the device such as an EUI-64 and a serial number or time stamp for the alert, but other forms that are unique among alerts sourced by a particular Alert Reporter are acceptable. An order number sourced by the filling application may be used in the case of an order (Pharmacy or Laboratory) and in this case must also serve to uniquely identify the related alerts. For identification of status updates to an alert indication see OBR-3 Filler order Number.

B.7.2 Time Stamps and Time Synchronization

Medical device data observations conveyed by the IHE PCD DEC Technical Frameworks should where feasible use 'consistent time' for MSH-7, OBR-7, OBR-8 and OBX-14, where 'consistent time' is based on a known reference time source such as NTP or similar service. Since medical devices may use local clocks that are not synchronized to 'consistent time', a standardized representation for disclosing how the device time(s) were mapped to 'consistent time' is required to provide traceability between the two.

In order to facilitate the correlation of transmitted observations, each observation should contain a time stamp from a consistent, isochronous time-base, either by default reference to [OBR-7, OBR-8) or by an overriding value in OBX-14. Since many medical devices have only a sense of local time, and this local time may not be equivalent to the local time of the DOR, it is a responsibility of the DOR to ensure the reported times within an Observation Result message are consistent. This means that all observation times reported SHOULD be UTC, as indicated by including a time zone offset of +0000, but it is permissible to use local time with the required correct time zone offset included in the timestamp representation since this can readily be converted to UTC whatever the time zone of the receiving system. In order to preserve the original time marking provided by the device, the Observation Result message SHALL contain a synchronization time element such as MDC_ATTR_TIME_ABS at the Medical Device System level which discloses the device's notion of, as described in the following table. The DOR SHALL use this device time as the basis for correcting the timestamps from the device (for example, for OBX-14) to the DOR's 'consistent time'.

Msg Segment	Description and comments	Status
MSH.....	**MSH-7** Date/Time of Message created/sent (DTM_{DOR})	M
PID.....		M
OBR.....	[**OBR-7**, **OBR-8**) Default time interval for child OBXs (DTM_{DOR})	M
OBX.. 0.0.0.1	MDC_TIME_SYNC_PROTOCOL (time sync protocol used by the DOR)	O
OBX.. 0.0.0.2	MDC_TIME_ACCURACY (known or estimated accuracy of DOR time)	O
OBX.. 1	**MDS for device #1**	M
OBX.. 1.0.0.1	MDC_TIME_CAP_STATE (BITS-16, using MdsTimeCapState)	O
OBX.. 1.0.0.2	MDC_TIME_SYNC_PROTOCOL (from nom-part-infrastructure)	O
OBX.. 1.0.0.3	MDC_TIME_SYNC_ACCURACY (device absolute time accuracy)	O
OBX.. 1.0.0.4	MDC_ATTR_TIME_ABS (**displayed** time) and **OBX-14** (DTM_{DOR})	C[1]

Msg Segment	Description and comments	Status
OBX.. 1.0.0.5	MDC_ATTR_TIME_REL (**relative** time) and **OBX-14** (DTM_{DOR})	C
OBX.. 1.0.0.6	MDC_ATTR_TIME_HI_RES (**hi-res rel** time) and **OBX-14** (DTM_{DOR})	C
OBX.. 1.0.0.7	OBX-14 (DTM_{DOR}, *optional*, overrides default [OBR-7, OBR-8] time interval	
OBX.. 1.0.0.7.1	OBX-14	
OBR.....	[**OBR-7**, **OBR-8**) Default time interval for child OBXs (DTM_{DOR})	M
OBX.. 2	**MDS for device #2**	M

Notes:

Status column gives Presence Qualifier, M: mandatory, O: option, C: conditional.

The dotted numbers represent the object hierarchy value of OBX-4 and are provided as example values only.

a. DTM_{DOR} is the datetime of the DOR, reported with an HL7 V2.6 'date/time' data type. A time stamp resolution of at least one second and a time zone offset are required, e.g., **YYYYMMDDHHMMSS**[.S[S[S**]]]+/-ZZZZ** (required items shown in bold font).

b. Within the time scope of each OBR and the time interval expressed in [OBR-7, OBR-8), time discontinuities in the MDC_ATTR_TIME_ABS displayed time are prohibited. Discontinuities due to daylight savings or other clock adjustments require that data on the new displayed timeline shall be sent as a separate OBR.

c. The OBR establishes the default time context for all its child OBXs, but can be overridden by a time stamp in OBX-14.

d. The time interval specified by [OBR-7, OBR-8) is a mathematically 'closed' interval for OBR-7 and 'open' for OBR-8. A datum that occurs exactly at the time specified by OBR-8 would be sent in the next time epoch. This allows subsequent OBR segments to represent a continuous sequence of time. For encoding a simple set of episodic measurement, if there is no logical "end" of the observation period, OBR-8 may be set to the message creation time to indicate the logical upper limit for the contained observations.

HL7 time stamps sent in MSH-7, OBR-7, OBR-8 and OBX-14 should in most situations be 'consistent time' based on NTP or any other reference time source that provides traceability to NTP when this is feasible. As a consequence, it is strongly encouraged that the gateway or application device (AHD) support synchronized time as an NTP or SNTP (or other time service) client so that it can (1) apply consistent time stamps to the data reported over the WAN interface and (2) provide a time synchronization service to the agents connected to it.

The MDC_ATTR_TIME_ABS (in OBX-3) observation provides traceability between the displayed time shown on the device, as a DTM datatype in OBX-5, and the corresponding gateway or AHD time reported in OBX-14.

The MDC_ATTR_TIME_REL and MDC_ATTR_TIME_HI_RES (in OBX-3) observations provide traceability between the relative or hi-resolution relative values, reported as an integer value in OBX-5, and the corresponding AHD time reported in OBX-14. The units-of-measure are μs or ms, expressed as MDC units.

B.7.3 Device Time Synchronization Capabilities

OBX-2: CWE

OBX-3: 68219^MDC_TIME_CAP_STATE^MDC

OBX-5: Valid device time capabilities include (one or more):

Table B.7.3-1: OBX-5 Values for Device Time Synchronization Capabilities

OBX-5 values (one or more ...)	Description
<0 or 1>^mds-time-capab-real-time-clock(0),	device supports an internal RTC
<0 or 1>^mds-time-capab-set-clock(1),	device supports Set Time Action
<0 or 1>^mds-time-capab-relative-time(2),	device supports RelativeTime
<0 or 1>^mds-time-capab-high-res-relative-time(3),	device supports HighResRelativeTime
<0 or 1>^mds-time-capab-sync-abs-time(4),	device syncs AbsoluteTime
<0 or 1>^mds-time-capab-sync-rel-time(5),	device syncs RelativeTime
<0 or 1>^mds-time-capab-sync-hi-res-relative-time(6),	device syncs HiResRelativeTime
<0 or 1>^mds-time-state-abs-time-synced(8),	AbsoluteTime is synced
<0 or 1>^mds-time-state-rel-time-synced(9),	RelativeTime is synced
<0 or 1>^mds-time-state-hi-res-relative-time-synced(10),	HiResRelativeTime is synced
<0 or 1>^mds-time-mgr-set-time(11)	manager is encouraged to set the time

B.7.4 Device and/or DOR Synchronization Protocol

Beyond the use of the MDC_ATTR_TIME_ABS, MDC_ATTR_TIME_REL, and MDC_ATTR_TIME_HI_RES time code observations, a DOR Device Observation Report MAY provide additional information about the device clocks, or its own clock, by communicating the MDC_TIME_SYNC_PROTOCOL of a given device.

OBX-2: CWE

OBX-3: 68220^MDC_TIME_SYNC_PROTOCOL^MDC

OBX-5: Valid synchronization profiles include (choice of one):

Table B.7.4-1: OBX-5 Values for Device and/or DOR Synchronization Protocol

OBX-5 values (choice of one)	Synchronization Protocol	Part::Code	Default
532224^MDC_TIME_SYNC_NONE^MDC	An uncalibrated and unsynchronized local clock source	8::7936	± 300 s (5 min)
———^MDC_TIME_SYNC_EBWW^MDC	A manually set time, by 'eyeball and wristwatch' [2]	–:——	± 120 s (2 min)
532225^MDC_TIME_SYNC_NTPV3^MDC	Network Time Protocol Version 3.0 (RFC 1305)	8::7937	calculate
532226^MDC_TIME_SYNC_NTPV4^MDC	Network Time Protocol Version 4.0 (under dev)	8::7938	calculate
532227^MDC_TIME_SYNC_SNTPV4^MDC	Simple Network Time Protocol v4 (RFC 2030)	8::7939	estimate

[2] The 'EBWW' code was defined in ISO/IEEE 11073-30200, indicating a local time-of-day clock that was manually set by the 'eyeball and wristwatch' method.

OBX-5 values (choice of one)	Synchronization Protocol	Part::Code	Default
532228^MDC_TIME_SYNC_SNTPV4330^MDC	Simple Network Time Protocol v4 (RFC 4330)	8::7940	estimate
532229^MDC_TIME_SYNC_BTV1^MDC	Bluetooth Medical Device Profile	8::7941	not absolute [3]
———^MDC_TIME_SYNC_NCK^MDC	HL7 V2 'NCK' System Clock Segment in NMD msg	–:——	+ 5 s, - 0 s
———^MDC_TIME_SYNC_GPS^MDC	Global Positioning Service (GPS)	–:——	calculate

B.8 OBX - Observation/Result segment

Refer to HL7 v2.6: Section 7.4.2

The HL7 OBX segment is used to transmit a single observation or observation fragment. For special considerations concerning OBX field usage in PCD-03 transactions, see section 3.3.4.4.8.

It is important to note that the values used for the OBX fields depend upon whether the OBX is being used to provide information about the device(s) from which measurements are derived or to provide information related to the measurement metrics and related information. Where this is the case the IHE PCD TF defines the appropriate coding for usage in a device related or metric related context. Each OBX shall be coded for a specific context – device related or metric related.

Table B.8-1: OBX segment

SEQ	LEN	DT	Usage	Card.	TBL#	Element name
1	4	SI	R	[1..1]		Set ID – OBX
2	3	ID	C	[0..1]	0125	Value Type
3	705	CWE	R	[1..1]		Observation Identifier
4	20	ST	R	[1..1]		Observation Sub-ID
5	99999	Varies	C	[0..1]		Observation Value
6	705	CWE	C	[0..1]		Units
7	60	ST	CE	[0..1]		References Range
8	5	IS	CE	[0..1]	0078	Abnormal Flags
9	5	NM	X	[0..0]		Probability
10	2	ID	CE	[0..1]	0080	Nature of Abnormal Test
11	1	ID	R	[1..1]	0085	Observation Result Status
12	24	DTM	X	[0..0]		Effective Date of Reference Range
13	20	ST	X	[0..0]		User Defined Access Checks
14	24	DTM	RE	[0..1]		Date/Time of the Observation
15	705	CWE	RE	[0..1]		Producer's ID
16	3220	XCN	RE	[0..1]		Responsible Observer
17	705	CWE	RE	[0..n]		Observation Method

[3] The synchronization accuracy of the Bluetooth BTV1 clock to an absolute time reference should be reported using MDC_ATTR_TIME_HI_RES, and OBX-5 should contain the value of the BTV1 clock.

SEQ	LEN	DT	Usage	Card.	TBL#	Element name
18	427	EI	RE	[0..1]		Equipment Instance Identifier
19	24	DTM	CE	[0..1]		Date/Time of the Analysis
20	705	CWE	RE	[0..*]	0163	Observation Site

OBX-1 Set ID - OBX

This field contains the sequence number of the OBX in this message; i.e., 1st OBX Set ID = 1, 2nd OBX set_ID = 2, etc., regardless of whether the OBX refers to a device or a metric value.

OBX-2 Value Type

Condition Predicate: must be valued if the value of OBX-11 is not X.

The Value Type field shall be filled according to HL7 Version 2.6 standard (table 0125). For example, if the result is ">300" the Value Type "SN" (Structured Numeric) SHALL be used instead of the "ST" (String) value type that was used in previous versions of HL7. See the details and the examples in the HL7 V2.6 (7.4.2). For an observation that consists of a time measurement (e.g., bleeding time) the TM Value Type is preferred to NM but this is not made mandatory.

Refer to TF-3 for details of the data types used in the mappings.

OBX-3 Observation Identifier

Identifies the type of device providing the related values. This is required if structured device (and if relevant, subdevice) identification is provided in the message. For the PDC TF, this shall be used for all devices capable of providing structured device information. For the IHE PCD transactions, implementations shall use the terms defined in the current version of the Harmonized Rosetta Terminology (Appendix K contains further details and references on the Rosetta Terminology Mapping as well as important information on system responsibilities regarding terminology). The Rosetta codes are based on terms from the ISO/IEEE 11073 Nomenclature where available, and where the Nomenclature does not currently contain a matching term, gives provisional vendor-neutral terms to be submitted to the appropriate ISO/IEEE 11073 as suggestions for adoption into the Nomenclature. If term cannot be found in this way and a matching term is available in LOINC, then the next preference is to use the LOINC term. If LOINC also does not support a term then coding scheme required by the HL7 standard takes precedence if a matching term is available. In the cases where such resources are not explicitly identified by standards, implementations may, by local arrangement, utilize any resource (including proprietary or local) to achieve compatibility among the systems involved, provided also that any licensing/copyright requirements are satisfied.)

In the case where the nomenclature term does not convey the distinction between an observation measurement and a setting for a quantity that may be either, see OBX-17 Observation Method for a way of encoding the distinction.

In the case where the nomenclature item does not distinguish between a manually initiated (episodic) measurement and one that is automatically initiated on a schedule (periodic measurement), the OBX-17 Observation Method may also be used to add this information.

OBX-4 Observation Sub-ID

This field shall be used to distinguish between multiple OBX segments and represent the hierarchical (containment) relations among the segments. It does so by providing an unambiguous mapping from observation contained in the OBX segment to the IEEE 11073 containment tree for

the Medical Device System sourcing the observation (See Appendix A Mapping ISO/IEEE 11073 Domain Information Model to HL7). For device related data this field is used to group devices hierarchically. For metric related data this field is used to associate metrics to devices hierarchically, and to each other. The dotted notation provided for in HL7 Ch7, 7.4.2.4, Fig 4 shall be used as follows: <MDS>.<VMD>.<Channel>.<Metric> [.FACET [.SUBFACET]], where the optional facet and subfacet entries are used only when specified for a particular profile, and distinguish multiple information items related to the same metric according to a specific scheme documented with the particular profile. For device related data that convey information about hierarchical levels higher than METRIC (that is, information about an MDS, VMD, or Channel), the entries in the dotted notation concerning the lower dot-levels (that is, VMD, Channel or metric levels for an MDS, channel and METRIC for a VMD, and so forth) have no meaning and this should be signified by setting them to zero). So, for information relating to the first MDS, OBX-4 should be 1.0.0.0. Receiving systems shall recognize from such trailing zeros in OBX-4 when the information applies to an MDS, VMD, or channel rather than a metric.

This scheme allows the VMD, CHAN, METRIC and FACET information to be associated with ‘ancestor’ information higher up in the observation hierarchy. This is especially critical for devices like infusion pumps that have multiple channels with the same METRIC level identifiers. The scheme uses simple dotted decimal numeric identifiers where each number is a nonnegative integer. These must create unique n-tuples for each OBX. (That is, each OBX in a set grouped within the scope of an OBR segment must have a distinct value of OBX-4).

The special value ‘0’ implies an ‘anonymous’ placeholder for the corresponding position in the containment hierarchy, for example an unspecified VMD and/or CHAN except when the '0' is part of a sequence of trailing '0' entries signifying that the dotted notation identifies data related to an MDS, VMD, or channel rather than a metric (see above).

IEEE 11073-20601 for Personal Health Devices does not use the VMD or CHAN levels, e.g., 1.0.0.1 would be used for the observation hierarchy MDC_DEV_SPEC_PROFILE_ PULS_OXIM / ~~VMD~~ / ~~CHAN~~ / MDC_PULS_OXIM_PULS_RATE.

The values of the 'dotted notations' of the OBX segments associated with a particular OBR (forming an ORDER_OBSERVATION segment group) establish a nested hierarchical arrangement representing the containment of lower-level within higher-level constructs (for example, all metric OBXes with a dotted notation beginning with '1.2' belong to the second VMD of the first MDS). This is exploited to support a form of inheritance for time stamps (see Section B.7.1 Time Stamps and Time Synchronization) so that, for example, a time stamp given in OBX-14 at the channel level applies to all metrics contained within that channel unless overridden by a time stamp in OBX-14 in the metric itself.

To facilitate processing and use of this containment hierarchy, OBX segments should be arranged in "dictionary order" of dotted notations, meaning for example that all metrics belonging to the second channel should appear together in order of their metric-level element of the dotted notation (x.y.2.1, x.y.2.2, etc.) after any metrics belonging to the first channel (x.y.1.z) and before any metrics belonging to the third channel (x.y.3.z). Similarly, all OBX segments belonging to the second VMD should be placed before those belonging to the second, and so forth. This scheme may be used for '0' values in any position simply by inserting them in the sort order before '1' values (simple numeric sort within dot position). Note that this is not a simple string sort, because of the possibility that the numbers in a particular level may be more than a single digit long (e.g., 1.11.2.3).

This ‘dictionary order’ should also be applied to device-related as well as to metric OBX segments: all MDS device-related segments for the first device should precede all VMD device-

related segments for the first VMD of the first device, which in turn should precede any channel device-related segment(s) for the first channel, if any, of the first device (recall that channels are optional), and any channel segments should precede all the metric OBX segments of the first VMD and channel of the first device. The order goes to the second channel of the first VMD if any, and so on until the contents of all the channels of the first VMD have been given, then device-related segments for the second VMD, and so on in a similar fashion. (This is in effect a depth-first traversal of the 11073 "containment tree" of the objects in the device).

OBX-5 Observation Value

Definition: This field contains the value observed by the observation producer. OBX-2-value type contains the data type for this field according to which observation value is formatted. It is not a required field because some systems will report only the normalcy/abnormalcy (OBX-8), especially in product experience reporting. The length of the observation field is variable, depending upon OBX-3-value type. This field may repeat for multipart, single answer results with appropriate data types, e.g., CWE, TX, and FT data types.

When the Observation Value is numeric, IHE PCD adopts the convention that the number of digits to the right of the decimal point shall reflect the precision ascribed by the device to the measurement and such digits shall not be arbitrarily dropped from string representations of the value. So if the measurement has, say, two significant digits after the decimal point and happens to include one or more trailing zeros, the string representing the measurement shall include the trailing zeros to reflect precision, even though they do not change the numeric value.

For the PCD TF this field is required for metric related segments and is null for device related segments.

OBX-6 Units

See HL7 2.6 Section 7.4.2.6 for further information.

For the PCD TF:

Condition predicate: If OBX-5 is populated then OBX-6 must contain an appropriate value. For Device Related if OBX-7 is being used for operating range then populate.

The units used should be in conformance with the Rosetta Terminology (see Appendix K for further details and references). The preferred format is an MDC value, secondly a UCUM value.

OBX-7 References Range

For metric related segments this should be used to provide the value 'alarm' ranges set with respect to the observed value metric in this OBX, although this is not strictly a reference range in the sense of the examples given in HL7.

For device related segments this may be used to provide the device measurement range capability – NOT the metric value 'alarm' ranges which shall be in the appropriate observed value metric OBX, as indicated above.

OBX-8 Abnormal Flags

This field can be used to provide zero or more codes (IS data type) to augment the interpretation of the observation. Codes beyond the first are included as repetitions (using the repetition separator character, the tilde ("~").

MeasurementStatus ::= BITS-16 { ... }	OBX-8 [4]	OBX-11
No bits set ⇒ raw device measurement; measurement okay, has not been reviewed nor validated		R
invalid(0),	INV	X
questionable(1),	QUES	R
not-available(2),	NAV	X
calibration-ongoing(3),	CAL	R
test-data(4),	TEST	R
demo-data(5),	DEMO	R
validated-data(8), -- relevant, e.g., in an archive		F
early-indication(9), -- early estimate of value	EARLY	R
msmt-ongoing(10), -- indicates that a new measurement is just being taken -- (episodic)	BUSY	X
msmt-state-in-alarm(14), -- indicates that the metric has an active alarm condition	ALACT	R
msmt-state-al-inhibited(15) -- metric supports alarming and alarms are turned off -- (optional)	ALINH	R

Further details of missing or invalid data can be given with codes based on nullFlavors:

Missing or Invalid Data Type	Code
No information	NI
Not applicable, no proper value	NA
Temporarily not available. Information is not available at this time but it is expected that it will be available later.	NAV
Numeric measurement function is available but has been deactivated by user.	OFF
Masked (as for security)	MSK
value not in domain	OTH
Not a number	NAN
Positive infinity	PINF
Negative infinity	NINF

OBX-11 Observation Result Status

This field should be filled according to HL7 Table 0085 described in Chapter 7 of HL7. For the IHE PCD TF, the possible values for this field for this profile are shown in table B.8-2: HL7 Table 0085 selected values. The value of X is used for device related segments where OBX-7 is

[4] The HL7 V2.6 IS data type is limited to 5 chars and so these mnemonics cannot be used. Although HL7 V2.7 replaces the IS datatype with the CWE datatype and longer mnemonics we need to restrict this to be compatible with HL7 V2.6 for now. OBX-8 can be a repeated field with ~ separators.

not used to express the device measurement range capability. Certain values of OBX-8 Abnormal Flags are semantically linked to OBX-11 Observation Results Status; see the table under OBX-8 for these cases.

Table B.8-2: HL7 Table 0085 selected values

Value	Description	Comment
C	Record coming over is a correction and thus replaces a final result	
D	Deletes the OBX record	
F	Final results; Can only be changed with a corrected result.	
P	Preliminary results	
R	Results entered -- not verified	
S	Partial results	
U	Results status change to final without retransmitting results already sent as 'preliminary.'	
W	Post original as wrong, e.g., transmitted for wrong patient	
X	Results cannot be obtained for this observation	

OBX-14 Date/Time of the Observation:

If this field is present in a 'metric' observation, its value overrides the time stamp in OBR-7. This should only be populated to signal an episodic observation such as noninvasive blood pressure. For periodically sampled observations where the time stamp for all observations in the message is the same and is given in OBR-7, OBX-14 should not be populated.

This implies that time stamp may be 'inherited' from the OBR, which is in effect a higher-level grouping element for the OBX segments it contains (i.e., that form part of the same ORDER_OBSERVATION segment group), unless the time stamp is overridden. In a similar way an OBX segment applying to a higher level in the MDS-VMD-channel-metric hierarchy establishes a default time stamp for its contained lower-level elements unless overridden by associating a time stamp with the lower-level element. So metric observations get their time stamps from their nearest 'ancestor' which has a time stamp in OBX-14 unless they have a time stamp of their own in OBX-14. Channel-level OBXs with filled OBX-14 fields establish a default time stamp for their contained metric observations.

For the PCD TF the value is the same as OBX-19 Date/Time of the Analysis, but should be used in preference to OBX-19 if time of the particular observation is relevant and is different than OBR-7 (that is, in the case of an episodic observation). The OBX-14 time stamp may be duplicated in OBX-19 if local needs dictate.

OBX-16 Responsible Observer

For the PCD TF:

The identifier values for the Operator ID field may null, if unknown or unspecified at the sending device.

Table B.8-3: Extended composite ID number and name for persons

SEQ	LEN	DT	Usage	Card.	TBL#	Component name
1	15	ST	R	[1.1]		ID Number
2	194	FN	RE	[0..1]		Family Name
3	30	ST	RE	[0..1]		Given Name

OBX-17 Observation Method

For metric related segments observation methods are in many cases implicit in device related MDC Ref_ID/codes; use of OBX17 is superfluous if given there. However, if observation method is needed and no device detail is shown then the method shall be given here.

The preferred format is an MDC value, secondly a LOINC value.

This field is repeatable, and may be used with multiple coded elements to reflect different aspects of the methods used to make an observation (for example, an episodic as opposed to continuous, periodic measurement for, say, cardiac output).

The observation may be identified as to whether it is measured, calculated, or a setting, using these codes based on IEE 11073 MetricCategory:

MetricCategory ::= BITS-16 { ... }	OBX-17
mcat-unspec(0),	UNSPEC^mcat-unspec^MDC
auto-measurement(1),	AMEAS^auto-measurement^MDC
manual-measurement(2),	MMEAS^manual-measurement^MDC
auto-setting(3),	ASET^auto-setting^MDC
manual-setting(4),	MSET^manual-setting^MDC
auto-calculation(5),	ACALC^auto-calculation^MDC
manual-calculation(6), -- relevant, e.g., in an archive	MCALC^manual-calculation^MDC

This field can convey the distinction between measurements (AMEAS or MMEAS) settings (MMEAS or MSET), as well as whether the measurement or setting was initiated by an operator (MMEAS, as in an episodic measurement, MSET, as in a manual setting) or automatically, as in a periodic measurement (AMEAS).

If omitted, the default value is AMEAS.

OBX-18 Equipment Instance Identifier

This field identifies the Equipment Instance (e.g., infusion pump, physiological monitor) responsible for the production of the observation. This is to provide specific traceability for the source of the observation, and so identification should identify the equipment at the lowest practical subsystem level where this applies: for example, the individual removable module in a physiological monitor. This allows an observation or a trouble indication to be traced to its source as specifically as possible.

For the PCD TF:

The preferred format is an EUI-64 Device ID. The Device Identifier should be globally unique.

Every device be should be identified by a universally unique identifier in the format specified by IEEE for the EUI-64 identifier (e.g., "1234567890ABCDEF"). To allow the Observation Reporting interface to be employed with 'legacy' Devices, this field may also be populated by a combination of serial number, model, and manufacturer (see Section C.5 EI Data Type for details of how this may be done). If the EUI-64 identifier is available, it should be recorded in the 'universal ID' component of this field. If it is not available, the manufacturer's unique device identifier (e.g., serial number) should be recorded in 'Entity Identifier' component (EI-1), with the model identification in the Namespace ID (EI-2), and the manufacturers identity in the universal ID (EI-3) using an OID or URI scheme (which should be identified in the universal ID type, EI-4).

Note that OBX-18 is repeatable, and HL7 suggests that where a hierarchical identification of the equipment is desired (e.g., module or VMD within Medical Device System) that the lowest-level equipment be sent first, followed by higher levels in succession.

An optimization is to not send the full hierarchy with every observation, but rather the identification should be sent at the highest level of device related OBX possible: i.e., MDS, then VMD, and then Channel. Inheritance should be assumed; i.e., for multivalued results from the same Device, this field is required only in the first OBX segment.

For metric related data this field is not required – unless no device hierarchy, and therefore related OBXs, is being declared; in which case the device ID should be provided here if available. Inheritance should be assumed; i.e., for multivalued results from the same Device, this field is required only in the first OBX segment.

Device identifiers shall be reported in OBX-18, data type 'EI' (Entity Identifier), for the MDS level for PCD devices and DEV_SPEC_PROFILE for PHD devices.

Table B.8-4: HL7 Component Table - EI – Entity Identifier

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME
1	199	ST	R		Entity Identifier
2	20	IS	RE	0363	Namespace ID
3	199	ST	C		Universal ID
4	6	ID	C	0301	Universal ID Type

Example 1: EUI-64

This is the preferred and most concise representation of an EUI-64.

```
|0123456789ABCDEF^^0123456789ABCDEF^EUI-64|
```

Example 2: IP address as a temporary identifier.

```
|172.16.171.63^GATEWAY_XY|
```

Example 3: Vendor-specific identifier string in OBX-18.1

All four OBX-18 components may be used to indicate a vendor-specific identifier string plus an identifier from HL7 Table 0301 - Universal ID type. Here EI-1 (Entity Identifier is the serial number of the equipment, EI-2 (Namespace ID) identifies the equipment model, EI-3 (Universal ID) identifies the manufacturer using a DNS domain name under the control of the manufacturer, and EI-4 (Universal ID Type) identifies the type of Universal ID contained in EI-3.

|123456^ICU_MONITOR^megacorp.com^DNS|.

See the discussion of the EI data type in Appendix section C.5 for further details and examples.

OBX-19 Date/Time of the Analysis

Conditional Predicate: May be used if duplicate of OBX-14 is needed in this field by receiving system.

For the PCD TF use OBX-14 preferentially if device time is relevant. Information in OBX-14 may be duplicated here if local needs dictate.

OBX-20 Observation Site

```
Components: <Identifier (ST)> ^ <Text (ST)> ^ <Name of Coding System (ID)> ^
            <Alternate Identifier (ST)> ^ <Alternate Text (ST)> ^ <Name of Alternate
            Coding System (ID)> ^ <Coding System Version ID (ST)> ^ <Alternate Coding
            System Version ID (ST)> ^ <Original Text (ST)>
```

Definition: This field typically contains the body site(s) where the measurement being reported was obtained. This field should not be used for a specimen source or specimen collection site.

This information is of particular importance if the clinical meaning of a value is modified either directly by the site (for example, is the temperature central or peripheral?) or if the site of one measurement impacts the value of another measurement (for example, is the finger SpO2 probe on the same arm as the NIBP cuff?). In most cases these observations are performed directly upon the patient and do not involve a specimen.

Any nationally recognized coding system might be used for this field including SNOMED or MDC; alternatively the HL7 Table 0163 may be used. Veterinary medicine may choose the tables supported for the components of this field as decided by their industry.

B.9 ORC – Common Order Segment

In PCD-03, the Common Order segment (ORC) is used to transmit fields that are common to all orders (all types of services that are requested). In PCD-01, ORC segments are not sent.

Table B.9-1: HL7 Attribute Table – ORC – Common Order

SEQ	LEN	DT	Usage	Card.	TBL#	ELEMENT NAME
1	2	ID	R	[1..1]	0119	Order Control
2	427	EI	R	[1..1]		Placer Order Number
3	427	EI	X	[0..0]		Filler Order Number
4	22	EI	RE	[0..1]		Placer Group Number
5	2	ID	RE	[0..1]	0038	Order Status
6	1	ID	RE	[0..1]	0121	Response Flag
7	705	TQ	X	[0..0]		Quantity/Timing
8	200	EIP	RE	[0..1]		Parent
9	24	DTM	R	[1..1]		Date/Time of Transaction
10	3220	XCN	RE	[0..*]		Entered By
11	250	XCN	RE	[0..*]		Verified By
12	3220	XCN	RE	[0..*]		Ordering Provider

SEQ	LEN	DT	Usage	Card.	TBL#	ELEMENT NAME
13	80	PL	RE	[0..1]		Enterer's Location
14	250	XTN	RE	[0..2]		Call Back Phone Number
15	24	DTM	RE	[0..1]		Order Effective Date/Time
16	705	CWE	RE	[0..1]		Order Control Code Reason
17	705	CWE	RE	[0..1]		Entering Organization
18	705	CWE	RE	[0..1]		Entering Device
19	705	XCN	R	[1..1]		Action By
20	705	CWE	RE	[0..1]	0339	Advanced Beneficiary Notice Code
21	250	XON	RE	[0..*]		Ordering Facility Name
22	250	XAD	RE	[0..*]		Ordering Facility Address
23	250	XTN	RE	[0..*]		Ordering Facility Phone Number
24	250	XAD	RE	[0..*]		Ordering Provider Address
25	705	CWE	RE	[0..1]		Order Status Modifier
26	60	CWE	RE	[0..1]	0552	Advanced Beneficiary Notice Override Reason
27	24	DTM	RE	[0..1]		Filler's Expected Availability Date/Time
28	705	CWE	RE	[0..1]	0177	Confidentiality Code
29	705	CWE	RE	[0..1]	0482	Order Type
30	705	CNE	RE	[0..1]	0483	Enterer Authorization Mode

The following describes the IHE PCD usage of those fields which have a usage other than X in the above table.

ORC-1 Order Control

Definition: Determines the function of the order segment. The PCD TF requires that this field be valued as RE when the RGV^O15^RGV_O15 Pharmacy/Treatment Give Message is used to send information from the Infusion Order Programmer (IOP) to the Infusion Order Consumer (IOC).

ORC-2 Placer Order Number

Definition: This field contains either the pharmacy system order number, the BPOC system order ID, or the BPOC administration event ID. This field is a case of the Entity Identifier data type. The first component required is a string that identifies an individual order (e.g., OBR). It is assigned by the place (ordering application). It identifies an order uniquely among all orders from a particular ordering application. The second through fourth components contain the application ID of the placing application in the same form as the HD data type. The second component, namespace ID, is a user-defined coded value that will be uniquely associated with an application. A given institution or group of intercommunicating institutions should establish a unique list of applications that may be potential placers and fillers and assign unique application IDs. The components are separated by component delimiters.

See Appendix C.5 , "EI Data Type" for further information.

See HL7 V2.6 Section 7.4.1.2 for details. This field is required for PCD-03.

ORC-3 Filler Order Number

```
Components: <Entity Identifier (ST)> ^ <Namespace ID (IS)> ^ <Universal ID (ST)> ^
            <Universal ID Type (ID)>
```

See HL7 V2.6 Section 4.5.1.3 for details. The PCD TF does not further constrain this field.

ORC-4 Placer Group Number

See HL7 V2.6 Section 4.5.1.4 for details. The PCD TF does not further constrain this field.

ORC-5 Order Status

See HL7 V2.6 Section 4.5.1.5 for details. The PCD TF does not further constrain this field.

ORC-6 Response Flag

See HL7 V2.6 Section 4.5.1.6 for details. The PCD TF does not further constrain this field.

ORC-8 Parent

See HL7 V2.6 Section 4.5.1.8 for details. The PCD TF does not further constrain this field.

ORC-9 Date/Time of Transaction

The time in this field should be the time the clinician initiated the program request, not the time the IOP generated the message. The IOC may use this field to determine if the request is stale or too old.

See HL7 V2.6 Section 4.5.1.9 for details. The PCD TF does not further constrain this field.

ORC-10 Entered By

See HL7 V2.6 Section 4.5.1.10 for details. The PCD TF does not further constrain this field

ORC-11 Verified By

See HL7 V2.6 Section 4.5.1.11 for details. The PCD TF does not further constrain this field.

ORC-12 Ordering Provider

See HL7 V2.6 Section 4.5.1.12 for details. The PCD TF does not further constrain this field.

ORC-13 Enterer's Location

See HL7 V2.6 Section 4.5.1.13 for details. The PCD TF does not further constrain this field.

ORC-14 Call Back Phone Number

See HL7 V2.6 Section 4.5.1.14 for details. The PCD TF does not further constrain this field.

ORC-15 Order Effective Date/Time

See HL7 V2.6 Section 4.5.1.15 for details. The PCD TF does not further constrain this field.

ORC-16 Order Control Code Reason

See HL7 V2.6 Section 4.5.1.16 for details. The PCD TF does not further constrain this field.

ORC-17 Entering Organization

See HL7 V2.6 Section 4.5.1.17 for details. The PCD TF does not further constrain this field.

ORC-18 Entering Device

See HL7 V2.6 Section 4.5.1.18 for details. The PCD TF does not further constrain this field.

ORC-19 Action By

```
Components: <ID Number (ST)> ^ <Family Name (FN)> ^ <Given Name (ST)> ^ <Second and
Further Given Names or Initials Thereof (ST)> ^ <Suffix (e.g., JR or III)
(ST)> ^ <Prefix (e.g., DR) (ST)> ^ <DEPRECATED-Degree (e.g., MD) (IS)> ^
<Source Table (IS)> ^ <Assigning Authority (HD)> ^ <Name Type Code (ID)> ^
<Identifier Check Digit (ST)> ^ <Check Digit Scheme (ID)> ^ <Identifier
Type Code (ID)> ^ <Assigning Facility (HD)> ^ <Name Representation Code
(ID)> ^ <Name Context (CWE)> ^ <DEPRECATED-Name Validity Range (DR)> ^
<Name Assembly Order (ID)> ^ <Effective Date (DTM)> ^ <Expiration Date
(DTM)> ^ <Professional Suffix (ST)> ^ <Assigning Jurisdiction (CWE)> ^
<Assigning Agency or Department (CWE)>
```

Definition: This field contains the identity of the caregiver who initiated the event.

Subfield XCN-1 "ID number" is required for each identifier.

ORC-20 Advanced Beneficiary Notice Code

See HL7 V2.6 Section 4.5.1.20 for details. The PCD TF does not further constrain this field.

ORC-21 Ordering Facility Name

See HL7 V2.6 Section 4.5.1.21 for details. The PCD TF does not further constrain this field.

ORC-22 Ordering Facility Address

See HL7 V2.6 Section 4.5.1.22 for details. The PCD TF does not further constrain this field.

ORC-23 Ordering Facility Phone Number

See HL7 V2.6 Section 4.5.1.23 for details. The PCD TF does not further constrain this field.

ORC-24 Ordering Provider Address

See HL7 V2.6 Section 4.5.1.24 for details. The PCD TF does not further constrain this field.

ORC-25 Order Status Modifier

See HL7 V2.6 Section 4.5.1.25 for details. The PCD TF does not further constrain this field.

ORC-26 Advanced Beneficiary Notice Override Reason

See HL7 V2.6 Section 4.5.1.26 for details. The PCD TF does not further constrain this field.

ORC-27 Filler's Expected Availability Date/Time

See HL7 V2.6 Section 4.5.1.27 for details. The PCD TF does not further constrain this field.

ORC–28 Confidentiality Code

See HL7 V2.6 Section 4.5.1.28 for details. The PCD TF does not further constrain this field.

ORC–29 Order Type

See HL7 V2.6 Section 4.5.1.29 for details. The PCD TF does not further constrain this field.

ORC–30 Enterer Authorization Mode

See HL7 V2.6 Section 4.5.1.30 for details. The PCD TF does not further constrain this field.

B.9.1 ORC Observation Control Segment in ACM Transaction PCD-04

This segment is optionally used to convey order request information for alerts involving notification of order request or order result. In addition, this segment may allow the association of the completed observation results reported in OBX segments with a particular previous order request.

Table B.9.1-1: HL7 Attribute Table – ORC – Observation Control

SEQ	LEN	DT	OPT	RP/#	TBL#	ELEMENT NAME
2	22	EI	O			Placer Order Number
12	250	XCN	O	Y		Ordering Provider
14	250	XTN	O	Y/2		Call Back Phone Number

ORC-2 Placer Order Number (EI) 00216

This field is the placer application's order number.

ORC-12 Ordering Provider (XCN) 00226

This field contains the identity of the person who is responsible for creating the request (i.e., ordering physician). ORC-12-ordering provider is the same as OBR-16-ordering provider. If the ordering provider is not present in the ORC, it may be present in the associated OBR. This is particularly important when results are transmitted in an ORU message. In this case, the ORC is not required and the identifying filler order number may be present in the OBR segment.

ORC-14 Call Back Phone Number (XTN) 00228

This field contains the telephone number to call for clarification of a request or other information regarding the order. ORC-14-call back phone number is the same as OBR-17-order callback phone number. If the structure of the telephony dial string is not known then the call back number should be in the Unformatted Telephone number (ST) component of the field.

Appendix C Common Data Types

This section describes PCD constraints of commonly used HL7 data types.

HL7 OBX-2 defines the Value Type that is used to express the value in OBX-5 based on HL7 Table 0125.

The PCD TF constrains the allowable value type to those shown in table C-1.

Table C-1: PCD Constrained HL7 Table 0125

Value	Description	Comment
CNE	Coded with No Exceptions	
CWE	Coded with Exceptions	
CF	Coded Element with Formatted Values	
DR	Date Range	

Value	Description	Comment
DTM	Date/Time	
ED	Encapsulated Data	
FT	Formatted Text	
NA	Numeric Array	
NM	Numeric	
PN	Person Name	
SN	Structured Numeric	
ST	String Data	
TM	Time	
XCN	Extended Composite Name and Number for Persons	
XPN	Extended Person Name	

C.1 CNE Data Type – coded with no exceptions

Used when a field must represent a distinct value (a code) from a closed set of acceptable values, where all the values must be drawn from code sets accepted by HL7, where the authority determining acceptance is the HL7 Vocabulary Work Group.

Definition: Specifies a coded element and its associated detail. The CNE data type is used when a required or mandatory coded field is needed. The specified HL7 table or imported or externally defined coding system must be used and may not be extended with local values.

Table C.1-1: CNE-Coded Element

SEQ	LEN	DT	Usage	Card.	TBL#	Component name
1	20	ST	R	[1..1]		Identifier
2	199	ST	R	[1..1]		Text
3	20	ID	RE	[0..1]	0396	Name of Coding System
4	20	ST	RE	[0..1]		Alternate Identifier
5	199	ST	RE	[0..1]		Alternate Text
6	20	ID	RE	[0..1]	0396	Name of Alternate Coding System
7	10	ST	C	[0..1]		Coding System Version ID
8	10	ST	O	[0..1]		Alternate Coding System Version ID
9	199	ST	O	[0..1]		Original Text

C.2 CWE Data Type – coded with exceptions

Used when a field must represent a distinct value (a code) from a closed set of acceptable values, but where some values may be drawn from outside code sets accepted by HL7. In IHE PCD, to

promote interoperability, where possible such values should be submitted to, and sanctioned by, the IHE PCD Technical Committee before use.

Definition: Specifies a coded element and its associated detail. The CWE data type is used when 1) more than one table may be applicable or 2) the specified HL7 or externally defined table may be extended with local values. See HL7 v2.6 2.A.13 for details.

Note that this data type allows for a primary and an alternate coding system. This can be used to identify coded values from two value sets, such as measurement identifiers for the same measurement from both the MDC (ISO/IEEE 11073) and SNOMED CT systems, or units of measure from both MDC and UCUM systems.

Table C.2-1: CWE-Coded Element

SEQ	LEN	DT	Usage	Card.	TBL#	Component name
1	40 (See Note)	ST	RE	[0..1]		Identifier
2	199	ST	R	[1..1]		Text
3	20	ID	RE	[0..1]	0396	Name of Coding System
4	20	ST	RE	[0..1]		Alternate Identifier
5	199	ST	RE	[0..1]		Alternate Text
6	20	ID	RE	[0..1]	0396	Name of Alternate Coding System
7	10	ST	C	[0..1]		Coding System Version ID
8	10	ST	O	[0..1]		Alternate Coding System Version ID
9	199	ST	O	[0..1]		Original Text

Note: HL7 Ch. 2A calls for a length limit of 20 on component 1 of CWE, but some codes required in this Technical Framework are longer, hence this deviation.

C.3 CX Data Type

Table C.3-1: CX-Extended Composite ID with check digit

SEQ	LEN	DT	Usage	Card.	TBL#	Component name
1	15	ST	R	[1..1]		ID Number
2	4	ST	RE	[0..1]		Identifier Check Digit
3	3	ID	RE	[0..1]	0061	Check Digit Scheme
4	227	HD	RE	[1..1]	0363	Assigning Authority
5	5	ID	RE	[1..1]	0203	Identifier Type Code
6	227	HD	RE	[0..1]		Assigning Facility
7	8	DT	RE	[0..1]		Effective Date
8	8	DT	RE	[0..1]		Expiration Date
9	705	CWE	RE	[0..1]		Assigning Jurisdiction
10	705	CWE	RE	[0..1]		Assigning Agency or Department

The constraints above particularly apply to the Patient Identifiers carried in the PID segment.

In the context of this PCD Framework, the Assigning Authority and the Identifier Type Code are considered to be important components for disambiguating identifiers, so these should be included whenever they are known.

A common value of the Identifier Type Code for a Patient Identifier assigned by the healthcare organization (PID-5) is "PI". Other values are defined in Table 0203 of HL7 2.6 section 2.A.14.5

Example: 12345^^^Saint-John Hospital^PI

C.4 DTM – date/time

Table C.4-1: HL7 Component Table - DTM – Date/Time

SEQ	LEN	DT	OPT	TBL#	COMPONENT NAME	COMMENTS	SEC.REF.
	24				Date/Time		2.A.22

HL7 Format: YYYY[MM[DD[HH[MM[SS[.S[S[S[S]]]]]]]]][+/-ZZZZ]

The time zone (+/-ZZZZ) is represented as +/-HHMM offset from Coordinated Universal Time (UTC), (formerly Greenwich Mean Time (GMT)), where +0000 or -0000 both represent UTC (without offset).

Note that if the time zone is not included, the time zone defaults to the local time zone of the sender.

C.5 Entity Identifier (EI) Data Type

Table C.5-1: EI-Entity Identifier

SEQ	LEN	DT	Usage	Card.	TBL#	Component name
1	199	ST	RE	[1..1]		Entity Identifier
2	20	IS	RE	[0..1]	0363	Namespace ID
3	199	ST	RE	[0..1]		Universal ID
4	6	ID	RE	[0..1]	0301	Universal ID Type

Definition: The Entity Identifier defines a given entity uniquely within a specified series of identifiers. A piece of equipment or an information system would be an example of an entity to be uniquely identified. In addition to the unique identifier in the first component, called somewhat confusingly by the same name as the data type itself, the Entity Identifier, the EI data type has 3 additional components that identify the 'assigning authority' that assigned the Entity Identifier. These function quite similarly to the three components of the Hierarchical Designator data type (see Appendix section C.6, HD Data Type).

Identifiers do not serve their purpose if they cannot be used to distinguish unambiguously all of the entities of a particular kind in the context in which they are applied. The HL7 specification discusses two kinds of identifiers: local and universal. Local identifiers only need to be unique within a limited scope agreed to by the sending and receiving systems, say, a particular hospital. The limitations of such a scheme are obvious: once you try to use such an identifier outside of its scope, another identifier in the wider scope may conflict with it (if, say, Alice Hospital and Barry Hospital merge and both have a monitor identified as "Monitor101").

A sort of intermediate but still local kind of identifier supplements the Entity Identifier with a Namespace ID. So the merged hospital could use a Namespace ID of "AH" for equipment names created in Alice Hospital and "BH" for ones from Barry Hospital. But as you go to wider scopes, such as a statewide reporting system, this intermediate system could still result in identifier clashes.

Universal identifiers avoid this problem by always including a unique identifier for the 'assigning authority' that created and manages the Entity Identifier. A Universal ID system must have a foolproof method for unambiguously identifying the 'assigning authority' over a 'universal' scope. Just allowing every assigning authority to name itself can still lead to name clashes. But there are a number of well-defined identifier systems that are designed to always yield unique identifiers. One that is familiar to programmers is the GUID, which gives a long hexadecimal number that can be generated on any suitably programmed computer with virtual certainty that the same number will not have been, and will not in the future be, generated by that computer or any other computer. EUI-64, ISO OIDs and URIs identifiers are other identifier schemes also are created according to well-defined rules such that each identifier system is intended to avoid applying the same identifier to the more than one entity no matter how wide the scope of applicability is.

When used as a Message Profile Identifier in MSH-21, Universal ID (EI-3) and Universal ID type must be populated as specified in Appendix B.1, , thus giving a Universal Identifier that receiving systems and test tooling can use to unambiguously identify the Message Profile of the message. In this context, EI-1 and EI-2 are not required, but may be populated to give a more human-readable identifier to the profile as stated in Appendix B-1.

In other contexts in PCD profiles, the ‘assigning authority’, as identified by Namespace ID (EI-2), Universal ID (EI-3), and Universal ID type (EI-4) is required. Assigning authorities in PCD profiles may, depending on context and need, be standards development organizations, manufacturers, software systems, or provider institutions. See the descriptions of particular fields with a data type of EI elsewhere in the Technical Framework.

Either Namespace ID (EI-2), giving a local identifier namespace, or (preferably) both Universal ID (EI-3), and Universal ID type (EI-4) are required.

When only Namespace ID (EI-2) is valued, the identification of the assigning authority is only local. Particularly when there are several concurrent assigning authorities within the healthcare enterprise, this Namespace ID will indicate which assigning authority provided the Entity Identifier (EI-1).

In preference to such a local ID, IHE PCD strongly recommends a Universal ID. In such a Universal ID, IHE PCD recommends that Namespace ID (EI-2) always be populated, but it is optional when both Universal ID (EI-3), and Universal ID type (EI-4) are given. When EI-3 and EI-4 identify the manufacturer, EI-2 may be used for the model identification, to further qualify the Entity Identifier (EI-1) which shall contain a unique identifier for the instance of the device, either an EUI-64 (in which case EI-1 will duplicate the information in EI-3) or a manufacturer’s serial number.

In IHE PCD, the order of preference for systems of Universal ID is: EUI-64, OID, URI, and last DNS (Domain Name Service).

Identifying with an EUI-64. Namespace ID (EI-2) is optional in this case and may contain a locally unique name for the application implementing PCD actor(s). Universal ID (EI-3) contains the EUI-64 identifier as a hexadecimal string. The IEEE defined 64-bit extended unique identifier (EUI-64) is a concatenation of the 24-bit company_id value assigned by the IEEE Registration Authority, and a 40-bit extension identifier assigned by the organization having that company_id assignment. The Universal ID Type (EI-4) contains the value EUI-64.

Identifying with an ISO OID. When an ISO OID is used, "Namespace ID" (EI-2) contains either a local name of the assigning authority or the device model number when a patient care device is being identified, "Universal ID" (HD-2) contains its universal OID, and "Universal ID Type" (EI-4) containing the value ISO.

Identifying with a URI. The Universal Resource Identifier, defined in IETF RFC 3306, encompasses the familiar Uniform Resource Locator (the URL “internet address” of a website, for example), and the Universal Resource Name, which need not identify a web resource but uniquely identifies an entity according to a number of unique identifier schemes, including some of the others listed, such as ISO OIDs (which can be made into URIs simply by prefixing the OID string with “urn:oid:”). The URI is placed in the Universal ID (EI-3) component and the Universal ID type (EI-4) is "URN".

Identifying with a DNS name. When the assigning authority is an information system or a manufacturer, it is acceptable to use a Domain Name Service name that uniquely identifies it. An IP address is a form of DNS, so it is also acceptable. These are less stable and permanent than the other Unique ID systems, which is why they are the least preferred.

When identifying a piece of equipment, an EUI-64 has the advantage of being inherently unique to the piece of equipment, and containing the identity of the manufacturer. A less preferred but acceptable alternative for identifying a particular equipment system or subsystem is to identify the manufacturer in Universal ID (and Universal ID type), the equipment model number in Namespace ID, and the serial number or other unique instance identifier of the equipment in Entity Identifier.

Example 1: a local Entity Identifier. Acceptable but deprecated

AB12345^RiversideHospital

Example 2: an Entity Identifier with an ISO OID Universal ID

AB12345^^1.2.840.45.67^ISO

Example 3: an Entity Identifier with an ISO OID Universal ID with locally defined Namespace Identifier included

AB12345^RiversideHospital^1.2.840.45.67^ISO

Example 4: EUI-64

This is the preferred and most concise representation of an EUI-64.

|0123456789ABCDEF^^0123456789ABCDEF^EUI-64|

Example 5: IP address as a temporary identifier.

|172.16.171.63^GATEWAY_GE|

Example 6: Vendor-specific identifier string in OBX-18.1

All four OBX-18 components may be used to indicate a vendor-specific identifier string plus an identifier from HL7 Table

Here EI-1 (Entity Identifier is the serial number of the equipment, EI-2 (Namespace ID) identifiers the equipment model, EI-3 (Universal ID) identifies the manufacturer using a DNS domain name under the control of the manufacturer, and EI-4 (Universal ID Type) identifies the type of Universal ID contained in EI-3.

|123456^ICU_MONITOR^megacorp.com^DNS|.

For further discussion and examples of the use of Entity Identifiers to identify equipment sourcing medical device data, see the description of HL7 field OBX-18 in Appendix section B.8.

IHE PCD constrains the length of the first component to 20 characters. National extensions can extend this length up to a maximum of 199.

C.6 Hierarchic Designator (HD) Data Type

Definition: The basic definition of the HD is that it identifies an (administrative or system or application or other) entity that has responsibility for managing or assigning a defined set of instance identifiers (such as placer or filler number, patient identifiers, provider identifiers, etc.). This entity could be a particular health care application such as a registration system that assigns patient identifiers, a governmental entity such as a licensing authority that assigns professional identifiers or drivers' license numbers, or a facility where such identifiers are assigned.

In the context of IHE PCD profiles, the HD data type appears directly as the data type for sending and receiving applications, and sending and receiving facilities, in the MSH segment (MSH fields MSH-3, MSH-4, MSH-5, and MSH-6).

The Hierarchic Designator (HD) data type also essentially forms part of the Entity Identifier (EI) data type which has other important roles in IHE PCD profile such as giving a placer or filler order number in OBR. The EI data type is made up of an Entity Identifier component (EI-1), plus additional components in the same form as the HD data type (EI-2 Namespace ID, corresponding to HD-1, EI-3 Universal ID corresponding to HD-2, and EI-4 Universal ID Type corresponding to HD-3). These additional components serve to identify the 'assigning authority' that is the source of the Entity Identifier. The EI data type is important in this Technical Framework for combining an identification of a particular entity (such as an information system) with the identification of the 'assigning authority' which assigned that particular identifier. See Appendix Section C.5 for details of this usage.

Table C.6-1: HD-Hierarchic designator

SEQ	LEN	DT	Usage	Card.	TBL#	Component name
1	20	IS	RE	[0..1]	0300	Namespace ID
2	999	ST	RE	[0..1]		Universal ID

SEQ	LEN	DT	Usage	Card.	TBL#	Component name
3	6	ID	RE	[0..1]	0301	Universal ID Type

The Namespace ID (HD-1) in HL7 in general may be populated with a strictly local identifier, which only needs to be understood in the same way by the individual sending and receiving applications. Where it is possible, IHE PCD discourages the use of such local identifiers and instead encourages the use of "Universal" types of identifier, specified by Universal ID and Universal ID Type, which carry a semantic context that can be understood widely in a context not limited to a single institution, with no risk of conflicting duplicate identifiers if the Universal ID system is used properly. The Universal ID (HD-2) should be a well-formed identifier according to a generally recognized system of identification such as the IEEE EUI-64 for hardware or software systems, or an ISO OID. The Universal ID type (HD-3) specifies which Universal ID system the Universal ID (HD-2) is drawn from.

The PCD TF requires that a field of Data Type HD be populated with:

- Either "Namespace ID" (HD-1) alone, which in this case contains a local identifier of the assigning entity.
- Or, preferably, with a recognized system of Universal IDs such as an EUI-64 or an ISO OID as Universal IDs. See the discussion under EI data type, Appendix Section C.5 for the application of Universal ID systems in IHE PCD profiles (note that the component names Namespace ID, Universal ID, and Universal ID Type are the same in HD and EI data types, but since the EI data type has an extra component, Entity Identifier, at the beginning, the component numbers are not the same between HD and EI).

C.7 PL Data Type

Table C.7-1: PL-Person Location

SEQ	LEN	DT	Usage	Card.	TBL#	Component name
1	20	IS	RE	[0..1]	0302	Point of Care
2	20	IS	RE	[0..1]	0303	Room
3	20	IS	RE	[0..1]	0304	Bed
4	227	HD	RE	[0..1]		Facility
5	20	IS	RE	[0..1]	0306	Location Status
6	20	IS	CE	[0..1]	0305	Person Location Type
7	20	IS	RE	[0..1]	0307	Building
8	20	IS	RE	[0..1]	0308	Floor
9	199	ST	RE	[0..1]		Location Description
10	427	EI	RE	[0..1]		Comprehensive Location Identifier
11	227	HD	RE	[0..1]		Assigning Authority for Location

IHE PCD Definition: This data type is used to specify a patient location within a healthcare institution, or other setting where healthcare is provided. Which components are valued depends on the needs of the site. For example, for a patient treated at home, only the person location type is valued.

Component 1: Point of Care (IS), required but may be empty:

HL7 definition: This component specifies the code for the point where patient care is administered. It is related to PL.6 Person Location Type (e.g., nursing unit or department or clinic). After floor, it is the most general patient location designation.

HL7 user-defined table 0302 does not suggest any values. The codification of points of care will be defined at the site level in acute care settings.

Component 2: Room (IS), required but may be empty:

HL7 definition: This component specifies the code for the patient's room. After point of care, it is the most general person location designation.

HL7 user-defined table 0303 does not suggest any values. The codification of rooms shall be defined at the site level in acute care settings.

Component 3: Bed (IS), required but may be empty:

HL7 definition: This component specifies the code for the patient's bed. After room, it is the most general person location designation.

HL7 user-defined table 0304 does not suggest any values. The codification of beds shall be defined at the site level in acute care settings.

Component 4: Facility (HD), required but may be empty:

HL7 definition: This component is subject to site interpretation but generally describes the highest level physical designation of an institution, medical center or enterprise. It is the most general person location designation.

The codification of facilities shall be defined at the highest level, according to the context of use of the PCD profile (acute care setting, ambulatory domain, etc.).

Component 6: Person Location Type (IS), conditional but may be empty:

IHE PCD condition: PL.6 is only populated if none of the other components of the PL data type are populated.

HL7 definition: Person location type is the categorization of the person’s location defined by facility, building, floor, point of care, room or bed. Although not a required field, when used, it may be the only populated field. It usually includes values such as nursing unit, department, clinic, SNF, physician’s office. Refer to HL7 User-defined Table 0305 - Person location type for suggested values.

Table C.7-2: HL7 User-defined Table 0305 - Person Location Type

Value	Description	Comment
C	Clinic	
D	Department	
H	Home	
N	Nursing Unit	
O	Provider’s Office	
P	Phone	
S	SNF	

National extensions of this profile may further constrain on extend this table.

Component 7: Building (IS), required but may be empty:

HL7 definition: This component specifies the code for the building where the person is located. After facility, it is the most general person location designation.

HL7 user-defined table 0307 does not suggest any values. The codification of buildings shall be defined at the site level in acute care settings.

Component 8: Floor (IS), required but may be empty:

HL7 definition: This component specifies the code for the floor where the person is located. After building, it is the most general person location designation.

HL7 user-defined table 308 does not suggest any values. The codification of floors shall be defined at the site level in acute care settings.

Component 9: Location description (ST), required but may be empty:

HL7 definition: This component describes the location in free text.

Component 10: Comprehensive Location Identifier (EI), required but may be empty:

HL7 definition: The unique identifier that represents the physical location as a whole without regard for the individual components. This accommodates sites that may have a different method of defining physical units or who may code at a less granular level. For example, point of care, room, and bed may be 1 indivisible code.

Component 11: Assigning Authority for Location (HD), required but may be empty:

HL7 definition: The entity that creates the data for the individual physical location components. If populated, it should be the authority for all components populated. Refer to HL7 User-defined Table 0363 - Assigning authority for suggested values for the first sub-component of the HD component, <namespace ID>.

By site agreement, implementers may continue to use HL7 User-defined Table 0300 - Namespace ID for the first sub-component.

C.8 XPN Data Type

Table C.8-1: XPN-Extended Person Name

SEQ	LEN	DT	Usage	Card.	TBL#	Component name
1	194	FN	RE	[0..1]		Family Name
2	30	ST	RE	[0..1]		Given Name
3	30	ST	RE	[0..1]		Second and Further Given Names or Initials Thereof
4	20	ST	RE	[0..1]		Suffix (e.g., JR or III)
5	20	ST	RE	[0..1]		Prefix (e.g., DR)
6	6	IS	X	[0..0]	0360	Degree (e.g., MD)
7	1	ID	R	[1..1]	0200	Name Type Code

SEQ	LEN	DT	Usage	Card.	TBL#	Component name
8	1	ID	RE	[0..1]	0465	Name Representation Code
9	705	CWE	RE	[0..1]	0448	Name Context
10	49	DR	X	[0..0]		Name Validity Range
11	1	ID	RE	[0..1]	0444	Name Assembly Order
12	24	DTM	RE	[0..1]		Effective Date
13	24	DTM	RE	[0..1]		Expiration Date
14	199	ST	RE	[0..1]		Professional Suffix

This data type is usually in a repeatable field, to allow a list of names. Examples: Legal name, display name.

2900 Subfield 1 "Family Name" is required if known to the sender.

Subfield 7 "Name Type Code" is required. The PAM profile allows these values from HL7 Table 0200 – Name type:

Table C.8-2: HL7 Table 0200 - Name Type

Value	Description	Comment
A	Alias Name	
B	Name at Birth	
C	Adopted Name	
D	Display Name	
I	Licensing Name	
L	Legal Name	
M	Maiden Name	
N	Nickname /"Call me" Name/Street Name	
R	Registered Name (animals only)	
S	Coded Pseudo-Name to ensure anonymity	
T	Indigenous/Tribal/Community Name	
U	Unspecified	

2905 This table may be further defined and restrained in national extensions of this profile.

Subfields 6 (Degree) and 10 (Name Validity Range) are deprecated in HL7 v2.6, therefore not supported by the PCD profile.

C.9 XTN Data Type

Table C.9-1: XTN-Extended Telecommunication Number

SEQ	LEN	DT	Usage	Card.	TBL#	Component name
1	199	ST	X			Telephone Number
2	3	ID	R	[0..1]	0201	Telecommunication Use Code

3	8	ID	R	[0..1]	0202	Telecommunication Equipment Type
4	199	ST	RE	[0..1]		Email Address
5	3	NM	RE	[0..1]		Country Code
6	5	NM	RE	[0..1]		Area/City Code
7	9	NM	RE	[0..1]		Local Number
8	5	NM	RE	[0..1]		Extension
9	199	ST	RE	[0..1]		Any Text
10	4	ST	RE	[0..1]		Extension Prefix
11	6	ST	X	[0..1]		Speed Dial Code
12	199	ST	X	[0..1]		Unformatted Telephone number
13	24	DTM	X	[0..0]		Effective Start Date
14	24	DTM	X	[0..0]		Expiration Date
15	705	CWE	X	[0..0]	0868	Expiration Reason
16	705	CWE	X	[0..0]	0618	Protection Code
17	427	EI	X	[0..0]		Shared Telecommunication Identifier
18	2	NM	X	[0..0]		Preference Order

Subfield 2 "Telecommunication Use Code" is required and is valued as either PRN "Primary Residence Number" or NET "Network (email) address. See HL7 Table 201.

Subfield 3 "Telecommunication Equipment Type" is required and is valued as PH "Telephone", Internet "Internet Address: Use Only If Telecommunication Use Code Is NET", or X.400 "X.400 email address: Use Only If Telecommunication Use Code Is NET". See HL7 Table 202.

Appendix D Reserved

Appendix E Examples of messages

These message examples illustrate the uses cases defined in PCD TF-1. They are not representative of messages in actual implementations but as examples to illustrate the use cases and the mapping of ISO/IEEE 11073 to HL7.

E.1 PCD-01 Case C1: Communicate periodic data to Clinical Information System (CIS)

Periodic and episodic data from all of the patient care devices associated with a particular patient are typically communicated to a CIS (Device Observation Consumer) by a monitoring gateway server (the DOR). Examples include data from a bedside monitor, point of care lab devices, ventilators, and infusion pumps. Discrete and data are communicated to the CIS. The primary intent is communication of structured data however provisions are made for inclusion of unstructured data. The patient associated with the data is identified and the data is time stamped with a consistent time across the respective patient care devices.

E.1.1 Example of PCD-01 Observation Report (Physiological Monitor)

An observation result from a physiological monitor.

```
MSH|^~\&|HL7^080019FFFF4F6AC0^EUI-
64|MMS|||20081211144500||ORU^R01^ORU_R01|12d15a9:11df9e61347:-
7fee:30456965|P|2.6|20081211144500||NE|AL||8859/1|||IHE PCD ORU-R01 2006^HL7^Universal
ID^HL7
PID|||AB60001^^^A^PI||BROOKS^ALBERT^^^^^L
PV1||E|3 WEST ICU^3001^1
OBR|1|080019FFFF4F6AFE20081211144657^AwareGateway^080019FFFF4F6AC0^EUI-
64|080019FFFF4F6AC020081211144657^AwareGateway^080019FFFF4F6AC0^EUI-
64|126.169.95.2^2000^MDC|||20081211144500
OBX|1|NM|147842^MDC_ECG_HEART_RATE^MDC|1.6.1.1|60|/min^/min^UCUM|||||R|||||||||
OBX|2|NM|148065^MDC_ECG_V_P_C_CNT^MDC|1.6.1.2|0|/min^/min^UCUM|||||R|||||||||
OBX|3|NM|150035^MDC_PRESS_BLD_ART_MEAN^MDC|1.3.1.1|92|mm[Hg]^mm[Hg]^UCUM|||||R|||||||
|
OBX|4|NM|150033^MDC_PRESS_BLD_ART_SYS^MDC|1.3.1.2|120|mm[Hg]^mm[Hg]^UCUM|||||R|||||||
|
OBX|5|NM|150034^MDC_PRESS_BLD_ART_DIA^MDC|1.3.1.3|80|mm[Hg]^mm[Hg]^UCUM|||||R|||||||||
OBX|6|NM|149522^MDC_BLD_PULS_RATE_INV^MDC|1.2.1.1|60|/min^/min^UCUM|||||R|||||||||
OBX|7|NM|150047^MDC_PRESS_BLD_ART_PULM_MEAN^MDC|1.4.2.1|14|mm[Hg]^mm[Hg]^UCUM|||||R|||
||||||
OBX|8|NM|150045^MDC_PRESS_BLD_ART_PULM_SYS^MDC|1.4.2.2|25|mm[Hg]^mm[Hg]^UCUM|||||R||||
|||||
OBX|9|NM|150046^MDC_PRESS_BLD_ART_PULM_DIA^MDC|1.4.2.3|10|mm[Hg]^mm[Hg]^UCUM|||||R||||
|||||
```

E.1.2 Example of PCD-01 Episodic Observation Report

Note that time stamps are present in the metric OBX segments (OBX-14). These override the timestamps at higher levels (here the channel level OBX and the containing OBR, which happen to be the same in this case but would be overridden by the lower-level time stamp if they were not). Note also that the dotted notation in OBX-4 on the MDS, VMD, and channel device data OBX segments have trailing zeroes below the hierarchical level they apply to (e.g., MDS has nonzero MDS-level value, followed by zeroes at the VMD, channel, and metric level).

```
MSH|^~\&|ACME_Gateway^080019FFFE3ED02D^EUI-64|ACME
Healthcare|||20110602050000||ORU^R01^ORU_R01|0104ef190d604db188c3|P|2.6|||NE|AL||UNICO
DE UTF-8|||PCD_DEC_001^IHE PCD^1.3.6.1.4.1.19376.1.6.1.1.1^ISO
PID|||12345^^^A^MR||BEDS^TEDSONS^^^^^L
PV1||U|COLWELL^^SOLAR
OBR|1|080019FFFE3ED02D20110602045842^ACME_Gateway^080019FFFE3ED02D^EUI-
64|080019FFFE3ED02D20110602045842^ACME_Gateway^080019FFFE3ED02D^EUI-
64|182777000^monitoring of patient^SCT|||20110602045842
OBX|1||69965^MDC_DEV_MON_PHYSIO_MULTI_PARAM_MDS^MDC|1.0.0.0|||||||X
OBX|2||70686^MDC_DEV_PRESS_BLD_NONINV_VMD^MDC|1.16.0.0|||||||X
OBX|3||70687^MDC_DEV_PRESS_BLD_NONINV_CHAN^MDC|1.16.1.0|||||||X|||20110602045842
OBX|4|NM|150021^MDC_PRESS_BLD_NONINV_SYS^MDC|1.16.1.1|111|mm[Hg]^mm[Hg]^UCUM|||||R|||2
0110602045842||||080019FFFE3ED02D172.16.172.135^GATEWAY_ACME
OBX|5|NM|150022^MDC_PRESS_BLD_NONINV_DIA^MDC|1.16.1.2|60|mm[Hg]^mm[Hg]^UCUM|||||R|||20
110602045842||||080019FFFE3ED02D172.16.172.135^GATEWAY_ACME
OBX|6|NM|150023^MDC_PRESS_BLD_NONINV_MEAN^MDC|1.16.1.3|80|mm[Hg]^mm[Hg]^UCUM|||||R|||2
0110602045842||||080019FFFE3ED02D172.16.172.135^GATEWAY_ACME
OBX|7|NM|149546^MDC_PULS_RATE_NON_INV^MDC|1.16.1.4|63|{beat}/min^{beat}/min^UCUM|||||R
|||20110602045842||||080019FFFE3ED02D172.16.172.135^GATEWAY_ACME
```

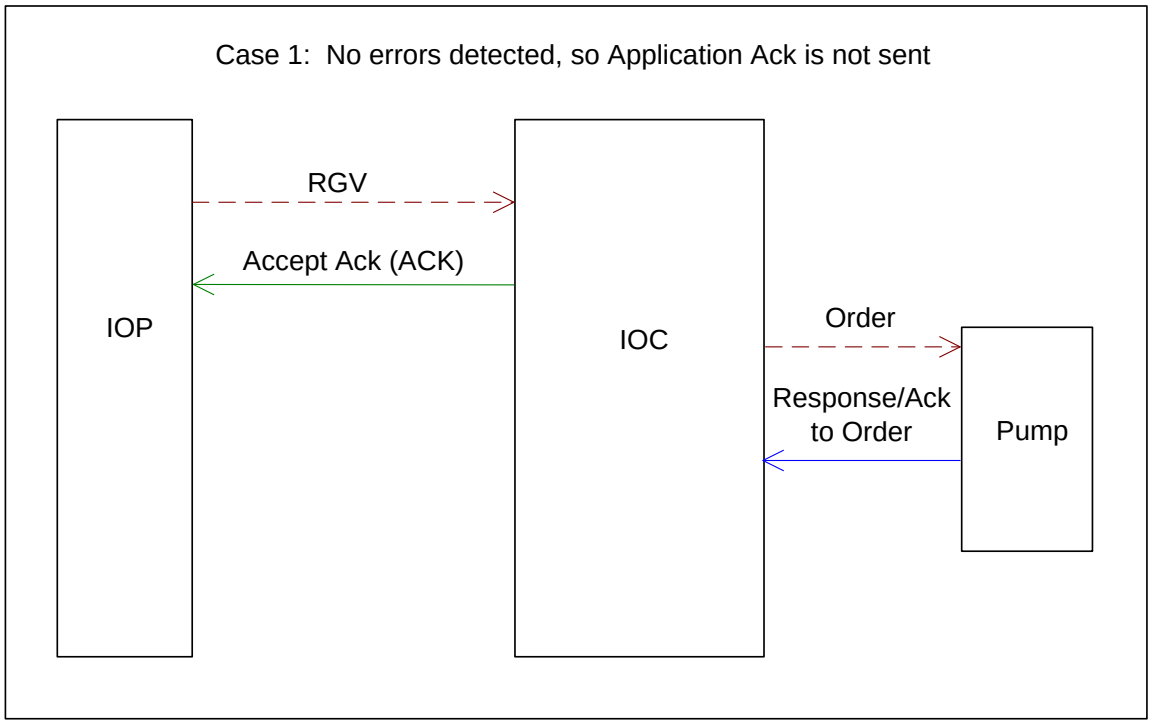
E.2 Examples of transaction PCD-03: Communicate Infusion Order

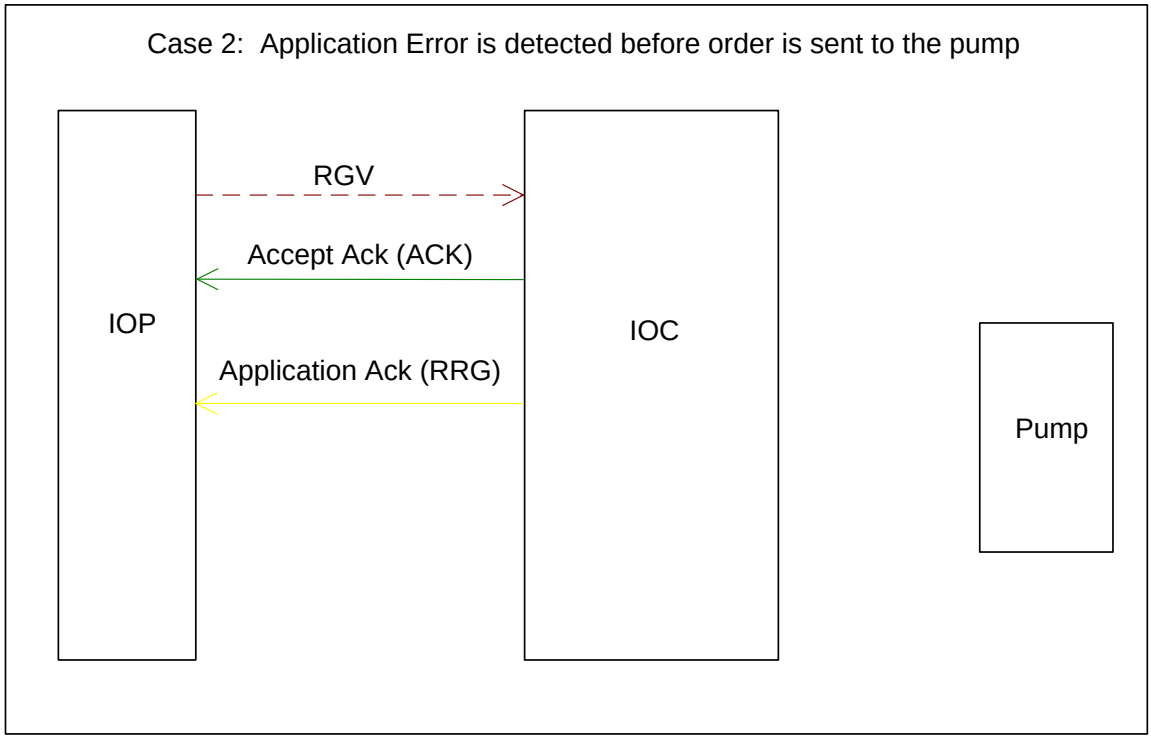
2985 This example illustrates the use of PCD-03.

E.2.1 Storyboard

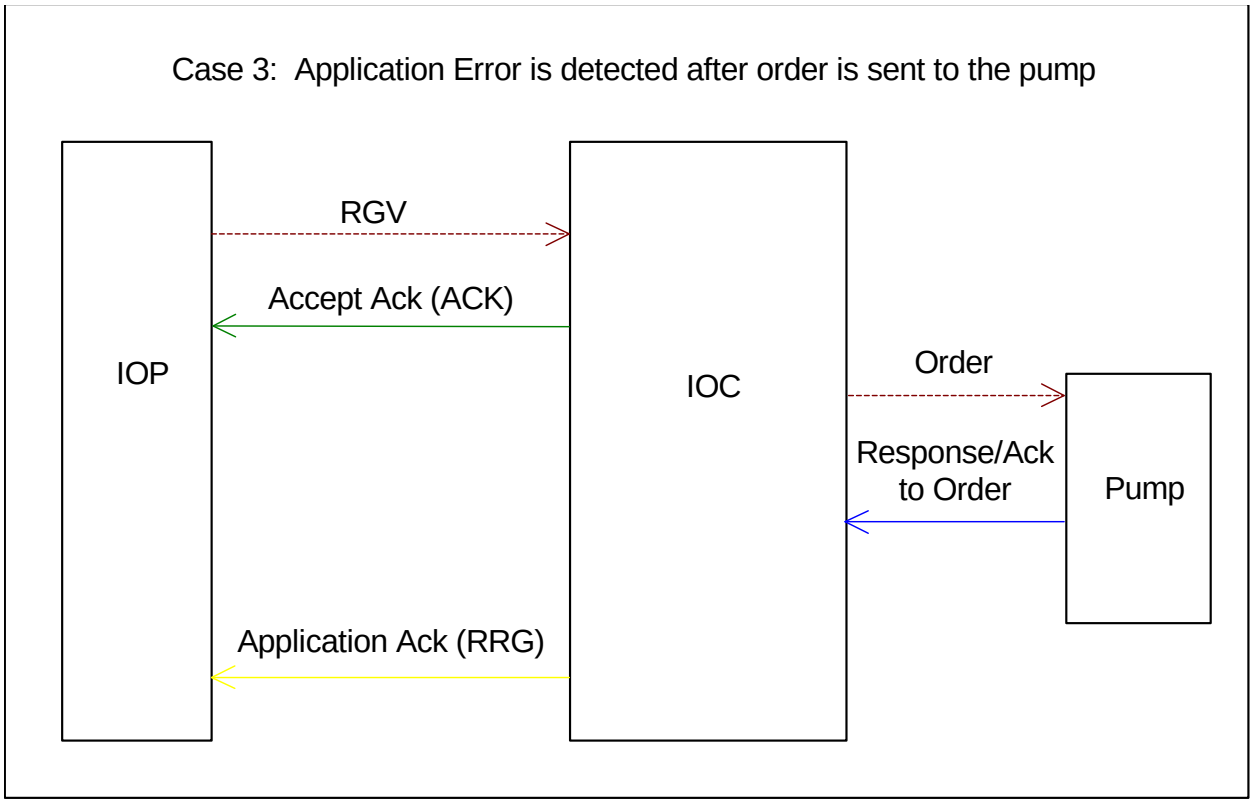
Objects	Attributes	
Patient	Legal Name: John Doe	
	ID: 98765	
	Sex: M	
	Date of birth: January 1, 1966	
	Weight: 85.0 kg	
Nurse	Jane Adams	
	ID: N0001	
Medication	Example 1	Example 2
	ID: 1234	ID: 5678
	Name: Dopamine	Name: Normal Saline
	Volume to be infused: 250 mL	Volume to be infused: 500 mL
	Concentration: 400 mg / 250 mL	Rate: 13.3 mL/hr
	Dose: 10 mcg/kg/min	
Pump	ID: A0001	

E.2.2 Interaction Diagram





2990



E.2.3 Messages

Example 1

Order #12345 for Patient ID 98765 (John Doe), Dopamine, volume to be infused 250 ml at 10 mcg/kg/min, concentration of 400 mg in 250 ml, patient weight 85.0 kg, Pump ID A0001, administered by nurse N0001.

Communicate Infusion Order

```
MSH|^~\&|IOPVENDOR^1234560000000001^EUI-
64|IOPVENDOR|IOCVENDOR^6543210000000001^EUI-64|IOCVENDOR|20080101123456-
0600||RGV^O15^RGV_O15|1|P|2.5|||AL|ER||ASCII|EN^English^ISO659||IHE_PCD_PIV_001
PID|||98765^^^IHE^PI||Doe^John^^^^^L||19660101000000-0600|M
ORC|RE|12345|||||||||||||||||N0001
RXG|1|||1234^Dopamine|250||263762^MDC_DIM_MILLI_L^MDC^mL^mL^UCUM ||||||||10|3
475^ug/kg/min^UCUM^265619^MDC_DIM_MICRO_G_PER_KG_PER_MIN^MDC|400|1746^mg^UCUM
^263890^MDC_DIM_MILLI_G^MDC|||||250|263762^MDC_DIM_MILLI_L^MDC^mL^mL^UCUM
RXR|IV||IVP
OBX|1||69986^MDC_DEV_PUMP_INFUS_VMD^MDC|||||||X|||||||^^A0001^PUMPVENDOR
OBX|2|NM|68063^MDC_ATTR_PT_WEIGHT^MDC||85.0|kg^kg^UCUM^263875^MDC_DIM_KILO_G^MDC
```

Accept Acknowledgement

```
MSH|^~\&|IOCVENDOR^6543210000000001^EUI-64|IOCVENDOR|IOPVENDOR^1234560000000001^EUI-
64|IOPVENDOR|20080101123456-
0600||ACK^O15^ACK|1|P|2.5||||||ASCII|EN^English^ISO659||IHE_PCD_PIV_001
MSA|CA|1
```

Example 2

Order #12345 for Patient ID 98765 (John Doe), Normal Saline, volume to be infused 500 ml at rate of 13.3 ml/hr, Pump ID A0001, administered by nurse N0001.

Communicate Infusion Order

```
MSH|^~\&|IOPVENDOR^1234560000000001^EUI-64|IOPVENDOR|IOCVENDOR^6543210000000001^EUI-
64|IOCVENDOR|20080101123456-
0600||RGV^O15^RGV_O15|2|P|2.5|||AL|ER||ASCII|EN^English^ISO659||IHE_PCD_PIV_001
PID|||98765^^^IHE^PI||Doe^John^^^^^L||19660101000000-0600|M
ORC|RE|12345|||||||||||||||||N0001
RXG|1|||5678^Normal Saline|500||263762^MDC_DIM_MILLI_L^MDC^mL^mL^UCUM
||||||||13.3|3122^mL/h^UCUM^265266^MDC_DIM_MILLI_L_PER_HR^MDC
RXR|IV||IVP
OBX|1||69986^MDC_DEV_PUMP_INFUS_VMD^MDC|||||||X|||||||^^A0001^PUMPVENDOR
```

Accept Acknowledgement

```
MSH|^~\&|IOCVENDOR^6543210000000001^EUI-64|IOCVENDOR|IOPVENDOR^1234560000000001^EUI-
64|IOPVENDOR|20080101123456-
0600||ACK^O15^ACK|102|P|2.5||||||ASCII|EN^English^ISO659||IHE_PCD_PIV_001
MSA|CA|
```

The infusion server cannot find the give code id in the infusion formulary. The infusion server issues an application acknowledgment reject message to the IOP.

Application Acknowledgment

```
MSH|^~\&|IOCVENDOR^6543210000000001^EUI-64|IOCVENDOR|IOPVENDOR^1234560000000001^EUI-
```



```
64|IOPVENDOR|20080101123456- 0600||
RRG^O16^RRG_O16|102|P|2.5||||||ASCII|EN^English^ISO659||IHE_PCD_PIV_001
MSA|AR|102
ERR|||207^ Application internal error|F|9010^Unable to match medication to drug library
```

E.3 ACM PCD-04 Example Messages

Alert - Numeric Limit Alarm

Patient Monitoring Device, Low SPO2 Alarm Indication, Start

```
MSH|^~\&|MINDRAY_EGATEWAY^00A037EB2175780F^EUI-
64|MINDRAY|AM_PHILIPS_IEM|PHILIPS|20120111150457-
0600||ORU^R40^ORU_R40|1|P|2.6|||NE|AL||UNICODE UTF-8|||IHE_PCD_ACM_001^IHE
PCD^1.3.6.1.4.1.19376.1.6.1.4.1^ISO
PID|||HO2009001^^^Hospital^PI||Hon^Albert^^^^^L||18991230|M
PV1||I|HO Surgery^OR^1
OBR|1|1^MINDRAY_EGATEWAY^00A037EB2175780F^EUI-
64|1^MINDRAY_EGATEWAY^00A037EB2175780F^EUI-
64|196616^MDC_EVT_ALARM^MDC|||20120111150457-
0600||||||||||||||||||||||^1&MINDRAY_EGATEWAY&00A037EB2175780F&EUI-64
OBX|1|ST|196670^MDC_EVT_LO^MDC|1.3.1.150456.1|Low
SpO2|||L~PM~SP|||R|||20120111150457-0600||||F1519EFX^SHENZHEN_DEVICE^mindray.com^DNS
OBX|2|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|1.3.1.150456.2|88|262688^MDC_DI
M_PERCENT^MDC|90-96||||R|||20120111150457-0600
OBX|3|ST|0^MDC_ATTR_EVENT_PHASE^MDC|1.3.1.150456.3|start||||||R
OBX|4|ST|0^MDC_ATTR_ALARM_STATE^MDC|1.3.1.150456.4|active||||||R
```

Alert - Qualitative (non-numeric) Alarm

Infusion Pump, Fluid Line Occlusion, Technical Alarm Indication Start

```
MSH|^~\&|PAT_DEVICE_BBRAUN^0012211839000001^EUI-
64|BBRAUN|AM_Philips_IEM|Philips|20120109175417-
0600||ORU^R40^ORU_R40|6346172845752460251|P|2.6|||NE|AL||ASCII|EN^English^ISO639||
IHE_PCD_ACM_001^IHE PCD^1.3.6.1.4.1.19376.1.6.1.4.1^ISO
PID|||HO2009003^^^AA1^PI||Hon^Amy^^^^^L|Coburn^^^^^^L|19610301000000-0600|F
PV1||I|HO 3 West ICU^10^1
OBR|1|63461728457571366 2^PAT_DEVICE_BBRAUN^0012211839000001^EUI-
64|P6013_4^PAT_DEVICE_BBRAUN^0012211839000001^EUI-
64|196616^MDC_EVT_ALARM^MDC|||20120109175417-0600
||||||||||||||||||||||^E0001_27&PAT_DEVICE_BBRAUN&0012211839000001&EUI-64
OBX|1|CWE|196616^MDC_EVT_ALARM^MDC|1.0.0.0.1|196940^MDC_EVT_FLUID_LINE_OCCL^MDC^^^^^^O
cclusion|||ST|||R|||||||P6013^^0012210000000000^EUI-64
OBX|2|CWE|0^MDC_ATTR_ALERT_SOURCE^MDC|1.0.0.0.2|
69985^MDC_DEV_PUMP_INFUS_MDS^MDC||||||X|||20120109175417-0600
OBX|3|ST|0^MDC_ATTR_EVENT_PHASE^MDC|1.0.0.0.3|start||||||R
OBX|4|ST|0^MDC_ATTR_ALARM_STATE^MDC|1.0.0.0.4|active||||||R
```

Infusion Pump, Fluid Line Occlusion, Technical Alarm Indication, End


```
MSH|^~\&|PAT_DEVICE_BBRAUN^0012211839000001^EUI-
64|BBRAUN|AM_Philips_IEM|Philips|20120109175426-
0600||ORU^R40^ORU_R40|6346172846620706282|P|2.6|||NE|AL||ASCII|EN^English^ISO639||
IHE_PCD_ACM_001^IHE PCD^1.3.6.1.4.1.19376.1.6.1.4.1^ISO
PID|||HO2009003^^^AA1^PI||Hon^Amy^^^^^L|Coburn^^^^^^L|19610301000000-
0600|F
PV1||I|HO 3 West ICU^10^1
OBR|1|634617284662070628^PAT_DEVICE_BBRAUN^0012211839000001^EUI-
64|P6013_4^PAT_DEVICE_BBRAUN^0012211839000001^EUI-
64|196616^MDC_EVT_ALARM^MDC|||20120109175426-
0600||||||||||||||||||||||^E0001_27&PAT_DEVICE_BBRAUN&0012211839000001&EUI-64
OBX|1|CWE|196616^MDC_EVT_ALARM^MDC|1.0.0.0.1|196940^MDC_EVT_FLUID_LINE_OCCL^MDC^^^^^^O
cclusion|||ST|||R|||||||P6013^^0012210000000000^EUI-64
OBX|2|CWE|0^MDC_ATTR_ALERT_SOURCE^MDC|1.0.0.0.2|69985^MDC_DEV_PUMP_INFUS_MDS^MDC||||||
X|||20120109175426-0600
OBX|3|ST|0^MDC_ATTR_EVENT_PHASE^MDC|1.0.0.0.3|end||||||R
OBX|4|ST|0^MDC_ATTR_ALARM_STATE^MDC|1.0.0.0.4|inactive||||||R
```

Alert – Advisory of undocumented timeout prior to surgical procedure

```
MSH|^~\&|CONTENT_CONSUMER_LIVEDATA|LIVEDATA|AM_Philips_IEM|Philips|20120109175426-
0600||ORU^R40^ORU_R40| 1233532926265-02|P|2.6|||NE|AL||ASCII|EN^English^ISO639||
IHE_PCD_ACM_001^IHE PCD^1.3.6.1.4.1.19376.1.6.1.4.1^ISO
PID|||HO2009003^^^AA1^PI||Hon^Amy^^^^^L|Coburn^^^^^^L|19610301000000-
0600|F
PV1||I|HO 3 West ICU^10^1
OBR|1||12345-2^LIVEDATA|203266^MDC_EVT_ADVIS_CHK^MDC |||20120109175426-
0600|||||||||8664693239
OBX|1|CWE|0^MDCX_DOCUMENTATION_ERROR^MDC|2.1.2.1.1|Timeout not
documented|||SA~PM|||R||20120109175426-0600
OBX|2|CWE|0^MDC_ATTR_ALERT_SOURCE^MDC |1.0.0.0.2|Procedure not documented on
time|||SA~PM|||R||20120109175426-0600
OBX|3|ST|0^MDC_ATTR_EVENT_PHASE^MDC |2.1.2.1.3|start||||||R
OBX|4|ST|0^MDC_ATTR_ALARM_STATE^MDC |2.1.2.1.4|active||||||R
```

Appendix F HL7 Message Profiling Convention

The messages used by each transaction are described in this document using static definitions as described for HL7 constrainable message profiles; refer to HL7 Version 2.6, Chapter 2, Section 2.12.6. The static definition of each message is represented within tables. The message level table represents the IHE-constrained message structure with its list of usable segments. The segment level table represents the IHE-constrained content of one segment with its usable fields.

F.1 Static definition - Message level

The message table representing the static definition contains the following columns:

- Segment: gives the segment name, and places the segment within the hierarchy of the message structure designed by HL7, but hiding the traditional square brackets and braces that designate optionality and repeatability in HL7 standard message tables. The beginning and end lines of a segment group (see HL7 Version 2.6, Chapter 2, Section 2.5.2 for definition) are designated in this column by --- (3 dashes).

- Meaning: Meaning of the segment as defined by HL7. The beginning of a segment group is designated by one line in this column giving the segment group name in all caps, prefixed by --- (3 dashes), and followed by the keyword "begin". The end of a segment group is designated by one line in this column giving the segment group name in all caps, prefixed by --- (3 dashes), and followed by the keyword "end".
- Usage: Coded usage of the segment, in the context of this IHE Integration Profile. The coded values used in this column are:

  R: Required: A compliant sending application shall populate all "R" elements with a non-empty value. A compliant receiving application may ignore the information conveyed by required elements. A compliant receiving application shall not raise an error due to the presence of a required element, but may raise an error due to the absence of a required element.
  R2: This is an IHE extension. If the sending application has data for the field, it is required to populate the field. If the value is not known, the field may not be sent.
  R+: This is an IHE extension. This is a field that IHE requires that was listed as optional within the HL7 standard.
  RE: Required but may be empty. The element may be missing from the message, but shall be sent by the sending application if there is relevant data. A conformant sending application shall be capable of providing all "RE" elements. If the conformant sending application knows a value for the element, then it shall send that value. If the conformant sending application does not know a value, then that element may be omitted. Receiving applications may ignore data contained in the element, but shall be able to successfully process the message if the element is omitted (no error message should be generated if the element is missing).
  O: Optional. The usage for this field within the message is not defined . The sending application may choose to populate the field; the receiving application may choose to ignore the field.
  C: Conditional. This usage has an associated condition predicate. (See HL7 Version 2.6, Chapter 2B, Section 2.B.7.6, "Condition Predicate".)
  If the predicate is satisfied: A compliant sending application shall populate the element. A compliant receiving application may ignore data in the element. It may raise an error if the element is not present.
  If the predicate is NOT satisfied: A compliant sending application shall NOT populate the element. A compliant receiving application shall NOT raise an error if the condition predicate is false and the element is not present, though it may raise an error if the element IS present.
  CE: Conditional but may be empty. This usage has an associated condition predicate. (See HL7 Version 2.6, Chapter 2B, Section 2.B.7.6, "Condition Predicate".)
  If the predicate is satisfied: If the conforming sending application knows the required values for the element, then the application must populate the element. If the conforming sending application does not know the values required for this element, then the element shall be omitted. The conforming sending application must be capable of populating the element (when the predicate is true) for all ‘CE’ elements. If the element is present, the conformant receiving application may ignore the values of that element. If the element is

not present, the conformant receiving application shall not raise an error due to the presence or absence of the element.
If the predicate is NOT satisfied: The conformant sending application shall not populate the element. The conformant receiving application may raise an application error if the element is present.
X: Not supported. For conformant sending applications, the element will not be sent. Conformant receiving applications may ignore the element if it is sent, or may raise an application error.

- Cardinality: Within square brackets, minimum and maximum number of occurrences authorized for this segment in the context of this Integration Profile.
- HL7 chapter: Reference of the HL7 v2.6 chapter that describes this segment.

Table F.1-1: Example-Initial segments of a message description

Segment	Meaning	Usage	Card.	HL7 chapter
MSH	Message Header	R	[1..1]	2
[	--- PATIENT begin		[1..1]	
PID	Patient Identification	R	[1..1]	3
[	--- PATIENT VISIT begin		[1..1]	
PV1	Patient Visit	RE	[0..1]	3

F.2 Static definition – Segment level and Data Type level

The Segment table and the Data Type table each contain 8 columns:

- SEQ: Position (sequence) of the field within the segment.
- LEN: Maximum length of the field
- DT: Field Data Type
- Usage: Usage of the field within this IHE Integration Profile. Same coded values as in the message level: R, RE, C, CE, O, X.
- Cardinality: Minimum and maximum number of occurrences for the field in the context of this Integration Profile.
- TBL#: Table reference (for fields using a set of defined values)
- ITEM#: HL7 unique reference for this field
- Element Name: Name of the field in a Segment table. / Component Name: Name of a subfield in a Data Type table.

Table F.2-1: Example-The MSH segment description

SEQ	LEN	DT	Usage	Card.	TBL #	Element name
1	1	ST	R	[1..1]		Field Separator

SEQ	LEN	DT	Usage	Card.	TBL #	Element name
2	4	ST	R	[1..1]		Encoding characters
3	227	HD	R	[1..1]	0361	Sending Application
…						

Appendix G HL7 Implementation Notes

G.1 Network Guidelines

The HL7 2.6 standard does not define a network communications protocol. Beginning with HL7 2.2, the definitions of lower layer protocols were moved to the Implementation Guide, but are not HL7 requirements. The IHE Framework makes these recommendations:

1. Applications shall use the Minimal Lower Layer Protocol defined in Appendix C of the HL7 Implementation Guide.
2. An application that wants to send a message (initiate a transaction) will initiate a network connection to start the transaction. The receiver application will respond with an acknowledgement or response to query but will not initiate new transactions on this network connection.

G.1.1 Acknowledgment Modes

ACKNOWLEDGMENT MESSAGES

Acknowledgment messages may be defined on an application basis. However the simple general acknowledgment message (ACK) may be used where the application does not define a special message (application level acknowledgment) and in other cases as described in Section 2.9, "Message Processing Rules".

The IHE PCD transaction PCD-03 supports ‘enhanced mode’ acknowledgements. See discussion under PCD-03 Transactions as well as in B.1 MSH – Message Header Segment and B.2 MSA – Message Acknowledgement Segment

G.2 Use of OSI Object Identifier (OID)

OSI Object identifiers (OIDs) are universal identifiers used in HL7 in a number of contexts.

Unlike GUIDs or UUIDs, which are generated by a completely uncentralized process (using an algorithm that can run on any computer that is extremely unlikely to ever generate the same ID twice), OIDs are generated by a hierarchical network of entities each of which is the ultimate authority for its own part of the tree. See ITI TF2x Appendix B for general specifications for OID syntax, and for obtaining an OID root for your organization.

The IHE PCD Technical Committee may issue OIDs from its reserved OID arc for the registration IHE PCD profiles, or for such other purposes as the Committee determines.

The following OID has been assigned to IHE PCD: 1.3.6.1.4.1.19376.1.6

ISO/IEEE 11073 nomenclature terms have OIDs from the arc 1.2.840.10004.1.1.1.0.0.1

HL7 allocates OIDs from the arc 2.16.840.1.113883 (joint-iso-itu-t.country.us.organization.hl7). HL7 maintains an OID registry at http://www.hl7.org/oid/index.cfm.

G.3 Message granularity

The sending application shall send as many messages as there are events recorded. For instance, if at the same time there is a change both to the patient's location (from emergency room to GI surgery ward) and to the patient's attending doctor (from Dr. Eric Emergency to Dr. John Appendectomy), the sending application will transmit two movements using HL7 messages ADT^A02 (transfer) and ADT^A54 (change attending doctor). Both events will have the same effective date/time (EVN-6 – Event Occurred). If the Historic Movement option is in use, each of these movements will have a unique identifier.

The exceptions to this fine granularity are:

The Admit Inpatient (A01) and Register Outpatient (A04) events can also assign a location and an attending doctor to the patient, known when the event is recorded.

A change of patient class (A06 or A07) also assigns at the same time a new location to the patient.

The Cancel Discharge/End Visit event also includes at the same time the patient location after the cancellation has been processed.

G.4 HL7 empty field convention

According to the HL7 standard, if the value of a field is not present, the receiver shall not change corresponding data in its database. However, if the sender defines the field value to be the explicit NULL value (i.e., two double quotes ""), it shall cause removal of any values for that field in the receiver's database. This convention is fully applied by IHE profiles based on HL7 v2.x messages.

Appendix H IHE Integration Statements

IHE Integration Statements are documents prepared and published by vendors to describe the intended conformance of their products with the IHE Technical Framework. They identify the specific IHE capabilities a given product is designed to support in terms of the key concepts of IHE: Actors and Integration Profiles (described in Volume I, section 2 of the IHE Technical Framework).

Users familiar with these concepts can use Integration Statements as an aid to determine what level of integration a vendor asserts a product supports with complementary systems and what clinical and operational benefits such integration might provide. Integration Statements are intended to be used in conjunction with statements of conformance to specific standards (e.g., HL7, DICOM, W3C, etc.).

IHE provides a process for vendors to test their implementation of IHE Actors and Integration Profiles. The IHE testing process, culminating in a multi-party interactive testing event called the

Connectathon, provides vendors with valuable feedback and provides a baseline indication of the conformance of their implementations. The process is not, however, intended to independently evaluate, or ensure, product compliance. In publishing the results of the Connectathon, and facilitating access to vendors' IHE Integration Statements, IHE and its sponsoring organizations are in no way attesting to the accuracy or validity of any vendor's IHE Integration Statements or any other claims by vendors regarding their products.

IMPORTANT -- PLEASE NOTE: Vendors have sole responsibility for the accuracy and validity of their IHE Integration Statements. Vendors' Integration Statements are made available through IHE simply for consideration by parties seeking information about the integration capabilities of particular products. IHE and its sponsoring organizations have not evaluated or approved any IHE Integration Statement or any related product, and IHE and its sponsoring organizations shall have no liability or responsibility to any party for any claims or damages, whether direct, indirect, incidental or consequential, including but not limited to business interruption and loss of revenue, arising from any use of, or reliance upon, any IHE Integration Statement.

H.1 Structure and Content of an IHE Integration Statement

An IHE Integration Statement for a product shall include:

1. The Vendor Name
2. The Product Name (as used in the commercial context) to which the IHE Integration Statement applies.
3. The Product Version to which the IHE Integration Statement applies.
4. A publication date and optionally a revision designation for the IHE Integration Statement.
5. The following statement:
6. "This product is intended to implement all transactions required in the IHE Technical Framework to support the IHE Integration Profiles, Actors and Options listed below:"
7. A list of IHE Integration Profiles supported by the product and, for each Integration Profile, a list of IHE Actors supported. For each integration profile/actor combination one or more of the options defined in the IHE Technical Framework may also be stated. Profiles, Actors and Options shall use the names defined by the IHE Technical Framework Volume I. (Note: The vendor may also elect to indicate the version number of the Technical Framework referenced for each Integration Profile.)

Note that implementation of the integration profile presumes implementation of all required transactions for an actor; options include optional transactions or optional functions for required transactions.

The statement shall also include references and/or internet links to the following information:

1. The specific internet address (or universal resource locator [URL]) where the vendor's Integration Statements are posted

2. The specific URL where the vendor's standards conformance statements (e.g., HL7, DICOM, etc.) relevant to the IHE transactions implemented by the product are posted.
3. The URL of the IHE Initiative's web page for general information on IHE (www.rsna.org/IHE).

An IHE Integration Statement is not intended to promote or advertise aspects of a product not directly related to its implementation of IHE capabilities.

H.2 Format of an IHE Integration Statement

Each Integration Statement shall follow the format shown below. Vendors may add a cover page and any necessary additional information in accordance with their product documentation policies.

IHE Integration Statement			
Vendor	Product Name	Version	Date
Any Medical Systems Company	Enterprise Communicator	V3.5	12 Dec 2006
This product implements all transactions in the IHE Technical Framework to support the IHE Integration Profiles, Actors, and Options listed below:			
Integration Profiles Implemented	Actors Implemented	Options Implemented	
Enterprise Communication of PCD Data	Device Observation Reporter	None	
Patient Identification Association	NA	None	
Internet address for vendors IHE Information: http://www.anymedicalsystems.com/ihe			
Links to Standards Conformance Statements for the Implementation			
HL7	http://www.anymedicalsystems.com/hl7		
IEEE	http://www.anymedicalsystems.com/hl7		
Links to general information on IHE			
In North America: http://www.ihe.net	In Europe: http://www.ihe-europe.org	In Japan: http://www.ihe-j.org	

Appendix I Message Transport using MLLP

IHE PCD HL7 V2 messages *may* be sent using the HL7-defined "Minimal Lower Layer Protocol" (MLLP). At the present time MLLP is used by all IHE PCD actors operating behind a hospital firewall, and the selection of MLLP versus other transport options is based on implementation or one-time configuration.

Guidance regarding MLLP is provided by the IHE ITI TF-2 Section C.2.1 *Network Guidelines*, which in turn reference the Minimal Lower Layer Protocol defined in Appendix C of the HL7 Implementation Guide.

Appendix J Message Transport using WS*

IHE PCD HL7 V2 messages *may* be sent over Web Services (WS*).

The IHE IT Infrastructure Technical Framework Volume 2x Appendix V provides guidance regarding the appropriate WSDL files, schema and sample XML messages. The following artifacts are provided here as informative implementations and should match the versions found in the IHE ftp://ftp.ihe.net/TF_Implementation_Material/ for PCD. If a later version is available at the ftp site, it should be used.

J.1 Sample WSDL file and schema

The Web Services Description Language (WSDL) is a W3C standard designed to define a web service through concrete endpoints and operations. The IHE IT Infrastructure Technical Framework Volume 2x Appendix V provides guidance on deriving WSDL files from an IHE transaction.

Non-normative illustrative examples of an WSDL file «DeviceObservationConsumer.wsdl» and schema «DeviceObservationConsumer.xsd» are shown below:

DeviceObservationConsumer.wsdl

```
<?xml version="1.0" encoding="UTF-8"?>
<wsdl:definitions name="DeviceObservationConsumer"
   targetNamespace="urn:ihe:pcd:dec:2010"
   xmlns:soap12="http://schemas.xmlsoap.org/wsdl/soap12/"
   xmlns:wsdl="http://schemas.xmlsoap.org/wsdl/"
   xmlns:xsd="http://www.w3.org/2001/XMLSchema"
   xmlns:wsaw="http://www.w3.org/2006/05/addressing/wsdl"
   xmlns:tns="urn:ihe:pcd:dec:2010">
   <wsdl:types>
      <xsd:schema>
         <xsd:import namespace="urn:ihe:pcd:dec:2010"
schemaLocation="DeviceObservationConsumer.xsd"/>
      </xsd:schema>
   </wsdl:types>
   <wsdl:message name="CommunicatePCDData_Message">
      <wsdl:documentation>Communicate PCD Data</wsdl:documentation>
      <wsdl:part name="body" element="tns:CommunicatePCDData"/>
   </wsdl:message>
   <wsdl:message name="CommunicatePCDDataResponse_Message">
      <wsdl:documentation>Communicate PCD Data Response</wsdl:documentation>
      <wsdl:part name="body" element="tns:CommunicatePCDDataResponse"/>
   </wsdl:message>
   <wsdl:portType name="DeviceObservationConsumer_PortType">
      <wsdl:operation name="CommunicatePCDData">
         <wsdl:input message="tns:CommunicatePCDData_Message"
wsaw:Action="urn:ihe:pcd:2010:CommunicatePCDData"/>
         <wsdl:output message="tns:CommunicatePCDDataResponse_Message"
```



```
wsaw:Action="urn:ihe:pcd:2010:CommunicatePCDDataResponse"/>
      </wsdl:operation>
   </wsdl:portType>
   <wsdl:binding name="DeviceObservationConsumer_Binding_Soap12"
type="tns:DeviceObservationConsumer_PortType">
      <soap12:binding style="document"
transport="http://schemas.xmlsoap.org/soap/http"/>
      <wsaw:UsingAddressing wsdl:required="true"/>
      <wsdl:operation name="CommunicatePCDData">
         <soap12:operation soapAction="urn:ihe:pcd:2010:CommunicatePCDData"
soapActionRequired=""/>
         <wsdl:input>
            <soap12:body use="literal"/>
         </wsdl:input>
         <wsdl:output>
            <soap12:body use="literal"/>
         </wsdl:output>
      </wsdl:operation>
   </wsdl:binding>
   <wsdl:service name="DeviceObservationConsumer_Service">
      <wsdl:port name="DeviceObservationConsumer_Port_Soap12"
binding="tns:DeviceObservationConsumer_Binding_Soap12">
         <soap12:address location="http://www.example.org/"/>
      </wsdl:port>
   </wsdl:service>
</wsdl:definitions>
```

Note: the element <wsaw:UsingAddressing wsdl:required="true"/> is required for strict conformance to IHE ITI Technical Framework Vol. 2x, Appendix V (and is required by IHE testing tools), but readers are warned that some web services infrastructure implementation will not use or recognize it, so it is well if feasible to be prepared to include it or not, to be prepared to deal with both situations.

DeviceObservationConsumer.xsd

```
<?xml version="1.0" encoding="UTF-8"?>
<schema xmlns="http://www.w3.org/2001/XMLSchema" xmlns:tns="urn:ihe:pcd:dec:2010"
targetNamespace="urn:ihe:pcd:dec:2010">
        <element name="CommunicatePCDData" type="tns:UnsolicitedObservationResult"/>
        <element name="CommunicatePCDDataResponse" type="tns:GeneralAckowledgement"/>
        <simpleType name="UnsolicitedObservationResult">
                <restriction base="string"/>
        </simpleType>
        <simpleType name="GeneralAckowledgement">
                <restriction base="string"/>
        </simpleType>
</schema>
```

J.2 Sample PCD-01 message and response

In addition to the WSDL-related rules found in Appendix V of the IHE ITI Technical Framework Volume 2, the framework contains a number of conformance constraints for web service consumers and providers. These rules were developed to improve IHE-related web service interoperability and PCD implementations using web services are required to comply.

Note that the contents of the urn:ihe:pcd:dec:2010:CommunicatePCDData element must contain the entire contents of a valid PCD-01 Observation Result message. However, based on the character restrictions of XML and web services, there are a number of characters that cannot be used in their literal form (see http://www.w3.org/International/questions/qa-controls#support for more information).

Restricted characters, such as "&” and "<cr>", must be escaped using XML predefined character entity references wherever possible (e.g., &). For restricted characters that have no predefined character entity references, a numeric character references should be used instead (e.g., &#d;). Messages containing characters which are prohibited from use in XML in both literal and escaped format are prohibited from being sent using the WS* transport profile.

For a complete list of excluded characters, please see the XML specification at http://www.w3.org/TR/xml/#syntax

Examples of a Communicate PCD Data message «CommunicatePCDData.xml» and a typical response «CommunicatePCDDataResponse.xml» are shown below (informative).

CommunicatePCDData.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<soapenv:Envelope xmlns:soapenv="http://www.w3.org/2003/05/soap-envelope">
    <soapenv:Header xmlns:wsa="http://www.w3.org/2005/08/addressing">
        <wsa:To soapenv:mustUnderstand="true">
http://localhost:9097/org.openhealthtools.stepstone.backend.gateway/DeviceObservationConsumer_Service
        </wsa:To>
        <wsa:From soapenv:mustUnderstand="true">
            <wsa:Address>
http://www.w3.org/2005/08/addressing/anonymous
</wsa:Address>
        </wsa:From>
        <wsa:MessageID soapenv:mustUnderstand="true">
            urn:uuid:A52590343911955D1A1251497585530
</wsa:MessageID>
        <wsa:Action soapenv:mustUnderstand="true">
            urn:ihe:pcd:2010:CommunicatePCDData
</wsa:Action>
    </soapenv:Header>
    <soapenv:Body>
        <CommunicatePCDData xmlns="urn:ihe:pcd:dec:2010">
MSH|^~\&amp;|AcmeInc^ACDE48234567ABCD^EUI-
64||||20090713090030+0500||ORU^R01^ORU_R01|MSGID1234|P|2.6|||NE|AL|||||IHE PCD ORU-R01
2006^HL7^2.16.840.1.113883.9.n.m^HL7&#xD;
PID|||789567^^^Imaginary Hospital^PI||Doe^John^Joseph^^^^L^A|||M&#xD;
OBR|1|AB12345^AcmeAHDInc^ACDE48234567ABCD^EUI-64|CD12345^AcmeAHDInc^ACDE48234567ABCD^EUI-
64|528391^MDC_DEV_SPEC_PROFILE_BP^MDC|||20090813095715+0500&#xD;
OBX|1||528391^MDC_DEV_SPEC_PROFILE_BP^MDC|1|||||||R|||||||0123456789ABCDEF^EUI-64&#xD;
OBX|2||150020^MDC_PRESS_BLD_NONINV^MDC|1.0.1||||||R|||20090813095715+0500&#xD;
OBX|3|NM|150021^MDC_PRESS_BLD_NONINV_SYS^MDC|1.0.1.1|120|266016^MDC_DIM_MMHG^MDC||||R&#xD;
OBX|4|NM|150022^MDC_PRESS_BLD_NONINV_DIA^MDC|1.0.1.2|80|266016^MDC_DIM_MMHG^MDC||||R&#xD;
OBX|5|NM|150023^MDC_PRESS_BLD_NONINV_MEAN^MDC|1.0.1.3|100|266016^MDC_DIM_MMHG^MDC||||R&#xD;
        </CommunicatePCDData>
    </soapenv:Body>
</soapenv:Envelope>
```

3355

CommunicatePCDDataResponse.xml

```
<?xml version="1.0" encoding="UTF-8"?>
<soapenv:Envelope xmlns:soapenv="http://www.w3.org/2003/05/soap-envelope">
    <soapenv:Header xmlns:wsa="http://www.w3.org/2005/08/addressing">
        <wsa:Action>
urn:ihe:pcd:2010:CommunicatePCDDataResponse
        </wsa:Action>
        <wsa:RelatesTo>
urn:uuid:F8C3FF2964F94E404E1251145112405
        </wsa:RelatesTo>
    </soapenv:Header>
    <soapenv:Body>
        <CommunicatePCDDataResponse xmlns="urn:ihe:pcd:dec:2010">
MSH|^~\&amp;|Stepstone||AcmeInc^ACDE48234567ABCD^EUI64||20090726095731+0500||ACK^A01^ACK|AMSGID1234|P|2.
6|&#xD;
MSA|AA|MSGID1234|Message Accepted|&#xD;
</CommunicatePCDDataResponse>
    </soapenv:Body>
</soapenv:Envelope>
```


Appendix K Message Transport Using WCTP (ACM Transactions PCD-06 and PCD-07)

The following appendix covers the messages exchanged between an IHE PCD ACM AM actor and an AC actor using the WCTP protocol

K.1 Abbreviations and definitions

HTTP – HyperText Transport Protocol
WCTP – Wireless Communications Transfer Protocol – the protocol between the ACM AM and the ACM AC actors.
MCR (Multiple Choice Response) – the means to pass a message with selectable responses from the ACM AM to the ACM AC actor.
XML – eXtensible Markup Language

What is WCTP

WCTP is the protocol between the ACM AM and the ACM AC actors. It makes use of an optionally securable (authentication and encryption) HTTP transport layer to convey XML-based WCTP protocol exchanges between a WCTP client (the ACM AM) and the WCTP server (the ACM AC).

K.2 Pre-Configuration

The HTTP source to destination is assumed to be resolved through pre-configuration.

Whether or not secure http (HTTPS) is used or not is resolved through pre-configuration

The WCTP PollerID and security password used to identify the message send requestor (not the request itself) are assumed to be resolved through pre-configuration.

The URI values for the WCTP senderID and sendResponseToID are assumed to be resolved through pre-configuration.

K.3 Endpoint Device Addressing

Endpoint entity (wireless device) addressing can be per WCTP (often the phone number of the endpoint device), but in any event it is presumed to be pre-configured so that there is a match from Alert Manager (AM) to Alert Communicator (AC).

K.4 Polling Versus Push Responses

The decision as to whether polling or push response is used for status updates is assumed to be resolved through pre-configuration. WCTP would be best used in its web push response form rather than polling for responses so as to maintain responsiveness of status updates and replies.

Some WCTP implementations have minimum tolerable poll intervals to reduce overall polling of the WCTP gateway server, the Alert Communicator (AC).

K.5 Constraints

The use of WCTP for ACM does not require Message Response Redirection.

Sub-second timing is not expected to be needed by ACM use of WCTP.

The WCTP messageID is used to track the status of a message that was sent from the AM to the AC.

The WCTP notifyWhen element should indicate notifyWhenDelivered (notify upon delivery to device) and notify upon read receipt.

If WCTP version query is not supported then a request for version query must not be ignored. It must be responded to with a Not Supported WCTP confirmation response.

K.6 Transactions

Table K.6-1: WCTP requests and responses

Request	AC actor (WCTP Server)	AM actor (WCTP Client)	Needed
	Receives	Submits	
wctp-ClientQuery	Yes	No	No (polling)
wctp-LookupSubscriber	Yes	No	No
wctp-LookupResponse	No	Yes	No
wctp-DeviceLocation	Yes	No	No
wctp-DeviceLocationResponse	No	Yes	No
wctp-MessageReply	Yes	Yes	Yes
wctp-PollForMessages	Yes	No	No
wctp-ReturnToSvc	Yes	No	Yes
wctp-SendMsgMulti	Yes	No	No
wctp-StatusInfo	Yes	Yes	No
wctp-SubmitClientMessage	Yes	No	Yes
wctp-SubmitRequest	Yes	Yes	No
wctp-VersionQuery	Yes	Yes	Yes

K.7 WCTP XML Element Common Data Items

Some message exchanges are administrative in nature, similar to TCP open, accept, and acknowledgement messages which are not documented as a part of HL7, while others have a direct and obvious place in the ACM profile as transactions, such as PCD-06 and PCD-07.

Please note, XML constant strings are presented in normal text. XML data to be filled in during implementation is presented in **bold red** text.
The format of WCTP conformant timestamps (**timestamp**) is: yyyy-mm-ddThh:mm:ss.ttt

All times are UTC. WCTP does not support the ability to indicate a time zone offset.

Hours (**hh)** in 24-hour format, and **.ttt** is the optional number of milliseconds

Example: 2011-01-19T20:33:52

A **push response URI** is the URI (URL minus the HTTP://) used to identify the HTTP POST destination for WCTP replies and status updates.

The **notification text** value is the actual text message to be presented to the wireless device operator.

The **sender ID** is the security identification of the IHE ACM actor to the WCTP receiver.

The **security code** is essentially the password to go with the security sender ID.

The **message ID** is the identification of the overall message to the ACM AC by the AM.

The **transaction ID** is the lower level transaction identification making up the message.

The **recipient PIN** is the identification of the destination device as per the ACM AC.

The **e-mail address** is the optional ACM AM contact information e-mail address.

The **phone number** is the optional ACM AM contact information voice telephony phone number.

The **web site** is the optional ACM AM contact information web site.

The **info string** is the optional ACM AM contact information comment.

The **priority** is any of HIGH, NORMAL, or LOW with a default of NORMAL.

The **sequence number** is a sequential value used for tracking polling requests and responses used during Virtual Pre-Connectathon testing.

The **batch size** is the numeric maximum count of responses a WCTP client (ACM AM) expects from a WCTP poll request to a WCTP server (ACM AC). A common value is 500.

The **WCTP version** indicates the expected version of WCTP XML message content supported.

Table K.7-1: WCTP version values

Value	Indicating WCTP version	MCR support
wctp-dtd-v1r1	1.1	None
wctp-dtd-v1r2	1.2	Unpaired
wctp-dtd-v1r3	1.3	Paired

The **WCTP DTD** identifies the URL of the DTD (Data Type Definition) for the indicated version of WCTP supported.

Table K.7-2: WCTP DTD values

Value	Indicating WCTP version	MCR support
http://dtd.wctp.org/wctp-dtd-v1r1.dtd	1.1	None
http://dtd.wctp.org/wctp-dtd-v1r2.dtd	1.2	Unpaired
http://dtd.wctp.org/wctp-dtd-v1r3.dtd	1.3	Paired

The **Next Poll Interval** is the number of seconds the ACM AM (WCTP client) should wait before again polling the ACM AC (WCTP server). The ACM AC (WCTP server) dictates this value to reduce the aggregate polling load on the WCTP server by all WCTP polling clients. Given that there are typically not many ACM AM instances per ACM AC instance this interval can be kept to a small single digit number of seconds. In typical WCTP wide area communication deployment there are often hundreds if not maybe thousands of WCTP clients per WCTP server.

The **graphics format** indicates the format of the graphical image information, and the value can be any one of SVG, JPEG, PNG, or BMP as agreed between the ACM AM actor vendor and the ACM AC actor vendor.

The **graphical image** is a base-64 encoded string representing one of the ecidentiary data static graphical images represented by one of the sets of evidentiary data from the ACM PCD-04 message sent from the ACM AR to the ACM AM.

The **telephony dial string** is an encoded telephony dial string, including any required prefixes, area codes, PBX switch hops, or pauses needed to permit the ACM AC endpoint communication device operator to make a telephone call from that device back to a patient's room or to the observation producer/order filler.

The **status update** is the string indicating the type of status update that the ACM AC is reporting back to the ACM AM in wctp-Notification. Possible values are as QUEUED, DELIVERED, or READ. Additionally there are the optional IHE PCD ACM profile specific values for IHEPCDCALLBACKSTART and IHEPCDCALLBACKEND in support of Call Back Number phone dialing by the operator of the ACM AC endpoint communication device and the resulting telephony call start and call end, the status of which are useful as logged items in alert response analysis.

The **Send Choice n** is the prompt component of an MCR request. This is the value used by the ACM AC to populate buttons, softkeys, or menu choices on the endpoint communication device for selection by the device operator. There can be multiple.

The **Reply Choice n** is the response value component of an MCR request. This value is correlated with its same ordinal occurrence **Send Choice n** value.

The **response text** is the string sent by the endpoint communication device of the ACM AC back to the ACM AM as the response to a notification message sent from the ACM AM to the ACM AC. In the case of an MCR response the text can be predefined. In the case of non-MCR responses the text can be an unexpected value.

K.8 WCTP client–server messages and responses

Sections are indicated as message classification – message type – usage indication

The message classification is either Administrative or the IHE PCD ACM message (PCD-06, PCD-07, etc.)

The messages type is the WCTP interface specification operation types.

The usage indication is used to distinctively indicate different uses for the same IHE PCD ACM message, like when MCR is not supported, supported but unpaired, or supported and paired, or to convey ACM profile proprietary extensions to WCTP like those needed to convey alert associated evidentiary information from the ACM AM to the ACM AC.

K.8.1 Administrative - wctp-VersionQuery

This message is used to determine whether or not the WCTP server, the ACM AC actor, supports Multiple Choice Response (MCR) pairs on SubmitRequest messages. See WCTP version above.

```
<?xml version="1.0"?>
<!DOCTYPE wctp-Operation SYSTEM “WCTP DTD” >
<wctp-Operation wctpVersion=“WCTP version”>
    <wctp-VersionQuery inquirer="push response URI" listDTDs="yes"/>
</wctp-Operation>
```

K.8.2 Administrative - wctp-VersionResponse

This message is used when **VersionQuery** operation is not supported.

```
<?xml version="1.0"?>
<!DOCTYPE wctp-Operation SYSTEM “WCTP DTD”>
<wctp-Operation wctpVersion=“WCTP version” wctpToken="11AA">
    <wctp-Confirmation>
        <wctp-Failure errorCode="300" errorText="Operation not supported.">
        </wctp-Failure>
    </wctp-Confirmation>
</wctp-Operation>
```

The assumption to this response is that the ACM AM is to use only WCTP 1.1 XML messages and not later, e.g., is no support for MCR.

K.8.3 Administrative - wctp-VersionResponse

This message is used when **Version Query** operation is supported.

```
<?xml version="1.0" encoding="utf-8"?>
<!DOCTYPE wctp-Operation SYSTEM “WCTP DTD”>
```

```
<wctp-Operation wctpVersion="WCTP version">
    <wctp-VersionResponse inquirer="push response URI" responder="responder name"
dateTimeOfRsp="timestamp" dateTimeOfReq="timestamp" invalidAfter="timestamp">
        <wctp-ContactInfo email="e-mail address" phone="phone number" www="web site"
info="info string" />
        <wctp-DTDSupport supportType="Supported" dtdName="WCTP version"
verToken="11AA" />
    </wctp-VersionResponse>
</wctp-Operation>
```

A response dtdName of "wctp-dtd-v1r3" indicates support for ACM profile conformant WCTP version 1.3 which indicates support for Multiple Choice Response (MCR) pairs on WCTP SubmitRequest messages. MCR pairs are used to populate soft keys on wireless device operator interfaces and so that the reply value can be vendor specific and still be presented in a vendor agnostic manner. A response of dtdName of "wctp-dtd-v1r2" indicates support for WCTP 1.2 which supports non-paired MCR.

K.8.4 IHE PCD-06 - wctp-SubmitRequest – no MCR

This message is used to send a message from the ACM AM to the ACM AC when MCR is not to be indicated because this is either a test message or the ACM AC does not support MCR.

```
<?xml version="1.0"?>
<!DOCTYPE wctp-Operation SYSTEM "WCTP DTD">
<wctp-Operation wctpVersion="WCTP version">
    <wctp-SubmitRequest>
        <wctp-SubmitHeader submitTimestamp="timestamp">
            <wctp-Originator senderID="sender ID" securityCode="security code"/>
            <wctp-MessageControl messageID="message ID" transactionID="transaction ID"
allowResponse="true" deliveryPriority="priority" notifyWhenDelivered="true"
preformatted="true"/>
            <wctp-Recipient recipientID="recipient PIN"/>
        </wctp-SubmitHeader>
        <wctp-Payload>
            <wctp-Alphanumeric>notification text</wctp-Alphanumeric>
        </wctp-Payload>
    </wctp-SubmitRequest>
</wctp-Operation>
```

K.8.5 IHE PCD-06 - wctp-SubmitRequest – Unpaired MCR

This message is used when the ACM AM wants to send a message to the ACM AC and while MCR is to be indicated the ACM AC does not support paired MCR so unpaired MCR is used.

```
<?xml version="1.0"?>
<!DOCTYPE wctp-Operation SYSTEM "WCTP DTD">
<wctp-Operation wctpVersion="WCTP version">
    <wctp-SubmitRequest>
        <wctp-SubmitHeader submitTimestamp="timestamp">
            <wctp-Originator senderID="sender ID" securityCode="security code"/>
            <wctp-MessageControl messageID="message ID" transactionID="transaction ID"
allowResponse="true" deliveryPriority="priority" notifyWhenDelivered="true"
preformatted="true" notifyWhenRead="true"/>
            <wctp-Recipient recipientID="recipient PIN"/>
        </wctp-SubmitHeader>
        <wctp-Payload>
            <wctp-MCR>
                <wctp-MessageText>notification text</wctp-MessageText>
                <wctp-Choice>Accept</wctp-Choice>
```

```
                <wctp-Choice>Reject</wctp-Choice>
            </wctp-MCR>
        </wctp-Payload>
    </wctp-SubmitRequest>
</wctp-Operation>
```

When using unpaired MCR the wctp-Choice value selected by the endpoint device operator is the response data from the WCTP server (the ACM AC) back to the WCTP client (the ACM AM).

K.8.6 IHE PCD-06 - wctp-SubmitRequest – Paired MCR

This message is used to send a message from the ACM AM to the ACM AC when the ACM AC supports paired MCR.

```
<?xml version="1.0"?>
<!DOCTYPE wctp-Operation SYSTEM “WCTP DTD”>
<wctp-Operation wctpVersion=“WCTP version”>
    <wctp-SubmitRequest>
        <wctp-SubmitHeader submitTimestamp="timestamp">
            <wctp-Originator senderID="sender ID" securityCode="security code"/>
            <wctp-MessageControl messageID="message ID" transactionID="transaction ID"
allowResponse="true" deliveryPriority="priority" notifyWhenDelivered="true"
preformatted="true" notifyWhenRead="true"/>
            <wctp-Recipient recipientID="recipient PIN"/>
        </wctp-SubmitHeader>
        <wctp-Payload>
            <wctp-MCR>
                <wctp-MessageText>notification text</wctp-MessageText>
                <wctp-ChoicePair>
                    <wctp-SendChoice>Send Choice 1</wctp-SendChoice>
                    <wctp-ReplyChoice>Reply Choice 1</wctp-ReplyChoice>
                </wctp-ChoicePair>
                <wctp-ChoicePair>
                    <wctp-SendChoice> Send Choice 2</wctp-SendChoice>
                    <wctp-ReplyChoice Reply Choice 2</wctp-ReplyChoice>
                </wctp-ChoicePair>
                <wctp-ChoicePair>
                    <wctp-SendChoice> Send Choice 3</wctp-SendChoice>
                    <wctp-ReplyChoice> Reply Choice 3</wctp-ReplyChoice>
                </wctp-ChoicePair>
            </wctp-MCR>
        </wctp-Payload>
    </wctp-SubmitRequest>
</wctp-Operation>
```

When using a paired MCR the selectable values presented to the endpoint device operator are in the wctp-SendChoice elements. Once selected the correlated reply value sent to the WCTP client (the ACM AM) is in the wctp-ReplyChoice element.

K.8.7 IHE PCD-06 wctp-SubmitRequest – Call Back Phone Number

The following ACM profile proprietary extensions to the wctp-SubmitRequest are used to convey the HL7 Call Back Phone Number from the ACM AM to the ACM AC.

The WCTP 1.3r1 interface specification that is the basis for ACM AM – AC communication does not support the ability to pass other than a client request contact phone number in association with a message submit request. For this reason the ACM profile is required to extend the WCTP 1.3r1 interface specification in a backward transparent manner in order to convey the HL7 Call Back Phone Number (OBR-17) from the ACM PCD-04 HL7 message received by the ACM AM from the ACM AR for sending to the ACM AC.

In order for the WCTP server (the ACM AC actor) to signal its willingness to receive and potentially support IHE ACM profile evidentiary data extensions to WCTP 1.3r1, per the extensions mechanism defined in section 3.6 Protocol Version of the WCTP 1.3r1 interface specification, the DTD response value shall be “IHEPCD-PCD06-V1R1” to indicate support for reception of the Call Back Phone Number extension to WCTP 1.3r1. This version shall presume at a minimum WCTP version 1.3r1 capabilities, with primary emphasis on the ability of the WCTP server (ACM AC actor) to support paired MCR if sent in a wctp-SubmitRequest message from the WCTP client (the ACM AM actor) to the WCTP server (the ACM AC actor).

On wctp-SubmitRequest messages the WCTP 1.3r1 interface specification supports a choice of one of wctp-Alphanumeric (simple text with no MCR), wctp-TransparentData (binary encoded data), or wctp-MCR (simple text accompanied with either unpaired or paired MCR). Since only smarter devices, associated with the newest WCTP implementations, are expected to make use of the additional alert evidentiary information in the PCD-06 transaction and so as to offload simple non-MCR message WCTP implementations from having to ignore the extensions, the wctp-MCR element tree has been selected as the extension point for the WCM related additional XML elements.

In order to pass the Call Back Phone Number used for the ACM nurse call use case for telephony call back to the patient in the room, or for the ACM laboratory results/observations use case for telephony call back to the results provider/order filler for any required results/observation read back, the following additional WCTP XML element is defined specifically to pass the telephony dial back string from the ACM AM to the ACM AC by means able to be more deterministically referenced than simply including the string in the message text sent to the endpoint communication device operator.

```
<wctp-IHEPCDDialback String=”telephony dial string” />
```

K.8.8 IHE PCD-07 - Synchronous response to wctp-SubmitRequest – Received by communications status update

This message is used by the ACM AC to convey immediate request status responses to the ACM AM while the submit request initiating TCP connection is still open. This is the means by which the PCD-07 status indication of **Received by communications** (accepted by WCTP gateway) is conveyed from the ACM AC to the ACM AM.

The following is an indication of the successful queuing of a message from the ACM AM to the ACM AC.

```
<?xml version="1.0"?>
<!DOCTYPE wctp-Operation SYSTEM “WCTP DTD”>
<wctp-Operation wctpVersion=“WCTP version” wctpToken="11AA">
```

```
    <wctp-Confirmation>
        <wctp-Success successCode="200" successText="Accepted">comment</wctp-Success>
    </wctp-Confirmation>
</wctp-Operation>
```

The following is an indication of the failed attempt to queue a message from the ACM AM to the ACM AC.

```
<?xml version="1.0"?>
<!DOCTYPE wctp-Operation SYSTEM “WCTP DTD”>
<wctp-Operation wctpVersion=“WCTP version” wctpToken="11AA">
    <wctp-Confirmation>
        <wctp-Failure errorCode="500" errorText="Timeout">comment</wctp-Failure>
    </wctp-Confirmation>
</wctp-Operation>
```

Refer to the WCTP interface specification for all possible values for successCode and successText as well as errorCode and errorText.

K.8.9 wctp-PollForMessages – general poll (for Pre-Connectathon/Virtual Connectathon testing)

In a Pre-Connectathon or Virtual Connectathon environment where firewalls may not permit the ACM AC to post asynchronous status updates and replies across the Internet there is a WCTP polling capability. As polling adds a potentially non-determinant delay in the ACM AM – AC interaction times the use of polling is not for use during IHE Connectathon testing nor should it be used in live deployments where the non-determinant delay could increase patient safety risk.

The following poll is a general poll and not a poll for status or replies for any specific messages.

```
<?xml version="1.0"?>
<!DOCTYPE wctp-Operation SYSTEM “WCTP DTD”>
<wctp-Operation wctpVersion=“WCTP version”>
    <wctp-PollForMessages pollerID="poller ID" securityCode="security code"
maxMessagesInBatch="batch size"/>
</wctp-Operation>
```

K.8.10 wctp-PollResponse – general poll (for Pre-Connectathon/Virtual Connectathon testing)

This is the general poll response sent by the ACM AC to the ACM AM when the poll response is that no messages have status updates or replies.

```
<?xml version="1.0"?>
<!DOCTYPE wctp-Operation SYSTEM “WCTP DTD”>
<wctp-Operation wctpVersion="1.0">
    <wctp-PollResponse minNextPollInterval=“Next Poll Interval”>
        <wctp-NoMessages/>
    </wctp-PollResponse>
</wctp-Operation>
```

K.8.11 wctp-PollResponse message status update (for Pre-Connectathon/Virtual Connectathon testing)

This is the general poll response sent by the ACM AC to the ACM AM when the poll response is that a message has a status update. The value of **status update** can be any of “QUEUED”, “DELIVERED”, or “READ”.

```
<?xml version="1.0"?>
<!DOCTYPE wctp-Operation SYSTEM “WCTP DTD”>
<wctp-Operation wctpVersion="1.0">
    <wctp-PollResponse minNextPollInterval=“Next Poll Interval”>
        <wctp-Message sequenceNo="sequence number">
            <wctp-StatusInfo>
                <wctp-ResponseHeader responseToMessageID="message ID"
responseTimestamp="timestamp">
                </wctp-ResponseHeader>
                <wctp-Notification type="status update" />
            </wctp-StatusInfo>
        </wctp-Message>
    </wctp-PollResponse>
</wctp-Operation>
```

K.8.12 wctp-PollResponse message status update acknowledgement (for Pre-Connectathon/Virtual Connectathon testing)

This is the poll response acknowledgement message sent from the ACM AM back to the ACM AC to let the AC know that the message status update has been successfully conveyed from the AC to the AM and that the AC can discard status updates for the messages.

```
<?xml version="1.0"?>
<!DOCTYPE wctp-Operation SYSTEM “WCTP DTD”>
<wctp-Operation wctpVersion=“WCTP version”>
    <wctp-PollForMessages pollerID="poller ID" securityCode="security code"
maxMessagesInBatch="batch size">
        <wctp-MessageReceived sequenceNo="sequence number">
            <wctp-Success successCode="200" successText="Message
accepted">comment</wctp-Success>
        </wctp-MessageReceived>
    </wctp-PollForMessages>
</wctp-Operation>
```

K.8.13 wctp-PollResponse (message reply, not in response to an MCR based wctp-SubmitRequest) (for Pre-Connectathon/Virtual Connectathon testing)

```
<?xml version="1.0"?>
<!DOCTYPE wctp-Operation SYSTEM “WCTP DTD”>
<wctp-Operation wctpVersion="1.0">
    <wctp-PollResponse minNextPollInterval=“Next Poll Interval”>
        <wctp-Message sequenceNo="sequence number">
            <wctp-MessageReply>
                <wctp-ResponseHeader responseToMessageID="message ID"
responseTimestamp="timestamp">
                </wctp-ResponseHeader>
                <wctp-Payload>
                    <wctp-Alphanumeric>response text</wctp-Alphanumeric>
                </wctp-Payload>
            </wctp-MessageReply>
```

```
        </wctp-Message>
    </wctp-PollResponse>
</wctp-Operation>
```

K.8.14 IHE PCD-07 asynchronous status update (DELIVERED - delivery confirmation)

The value of **status update** would be “DELIVERED”.

```
<?xml version="1.0" encoding="utf-16"?>
<!DOCTYPE wctp-Operation SYSTEM “WCTP DTD”>
<wctp-Operation wctpVersion=“WCTP version”>
    <wctp-StatusInfo>
        <wctp-ResponseHeader responseTimestamp="timestamp"
respondingToTimestamp="timestamp" onBehalfOfRecipientID="recipient PIN">
            <wctp-Originator senderID="sender ID" />
            <wctp-MessageControl messageID="message ID" transactionID="transaction ID"
/>
            <wctp-Recipient authorizationCode="" />
        </wctp-ResponseHeader>
        <wctp-Notification type="status update" />
    </wctp-StatusInfo>
</wctp-Operation>
```

K.8.15 IHE PCD-07 asynchronous status update (READ - read receipt)

The value of **status update** would be “READ”.

```
<?xml version="1.0" encoding="utf-16"?>
<!DOCTYPE wctp-Operation SYSTEM “WCTP DTD”>
<wctp-Operation wctpVersion=“WCTP version”>
    <wctp-StatusInfo>
        <wctp-ResponseHeader responseTimestamp="timestamp"
respondingToTimestamp="timestamp" onBehalfOfRecipientID="recipient PIN">
            <wctp-Originator senderID="sender ID" />
            <wctp-MessageControl messageID="message ID" transactionID="transaction ID"
/>
            <wctp-Recipient authorizationCode="" />
        </wctp-ResponseHeader>
        <wctp-Notification type="status update" />
    </wctp-StatusInfo>
</wctp-Operation>
```

K.8.16 IHE PCD-07 asynchronous reply message with MCR

```
<?xml version="1.0" encoding="utf-16"?>
<!DOCTYPE wctp-Operation SYSTEM “WCTP DTD”>
<wctp-Operation wctpVersion=“WCTP version”>
    <wctp-MessageReply MCRMessageReply="true">
        <wctp-ResponseHeader responseToMessageID="message ID"
responseTimestamp="timestamp" respondingToTimestamp="timestamp"
onBehalfOfRecipientID="recipient PIN">
            <wctp-Originator senderID="sender ID" miscInfo="" />
            <wctp-MessageControl messageID="message ID" transactionID="transaction ID"
/>
            <wctp-Recipient recipientID="recipient PIN" />
        </wctp-ResponseHeader>
        <wctp-Payload>
            <wctp-Alphanumeric>response text</wctp-Alphanumeric>
        </wctp-Payload>
```

```
    </wctp-MessageReply>
</wctp-Operation>
```


Glossary

ACC: American College of Cardiology http://www.acc.org/

ACCE: American College of Clinical Engineering http://www.accenet.org/

Actor: An entity within a use case diagram that can perform an action within a use case diagram. Possible actions are creation or consumption of a message.

ADT: Admit, Discharge & Transfer

AHD: Application Hosting Device – in the context of home health care, an intermediary or gateway device which may act as a Device Observation Reporter on behalf of associated home health care devices.

Alarm: A clinical alarm is an indication from a system or device, that when activated, indicates a condition requiring urgent clinical intervention.

Alert: A clinical alert is an indication from a system or device that a condition exists which requires attention. In addition to clinically-based patient physiologic alarms requiring clinical attention, this category also includes technical conditions in the device that require technical attention, such as 'battery low' in a telemetry unit.

Aperiodic: Patient care device data which are communicated without a regular sampling interval or period, that is, data observed at irregular intervals, such as a noninvasive (cuff) blood pressure or a typical thermodilution Cardiac Output measurement.

Authoritative: Acknowledged to be reliable.

BCMA: Bedside Computer-Assisted Medication Administration system

Bedside: The point of care, typically in an acute care environment.

Binding: Process of associating two related elements of information, such as a clinical observation and the identity of the patient that it is observed on.

Biometric: measurable, physical characteristic or personal behavioral trait used to recognize the identity, or verify the claimed identity.

BPOC: Barcode Point of Care system

CDR: Clinical Data Repository.

CIS: Clinical Information System.

CLIA: Clinical Laboratory Improvement Amendments. http://www.cms.hhs.gov/clia/

Connectathon: IHE testing process a weeklong interoperability testing event where participating companies to test their implementation of IHE capabilities with corresponding systems from industry peers.

Containment tree: The Domain Information Model for patient care devices defined in ISO/IEEE 11073 includes a hierarchy of objects representing the structure of a device: medical device system (MDS), virtual medical device (VMD), channel, and metric. An object in a device

is described in terms of the objects containing it in this hierarchy, that is, its containment tree. See also **Dotted Notation**.

CT: Consistent Time Integration Profile.

Device Observation Reporter (DOR): An abstract actor responsible for sending PCD data in conformance with the IHE PCD message profile(s) based on ISO/IEEE 11073. This may require mapping legacy and standards based PCD data to the IHE PCD message profile(s).

DICOM: Digital Imaging and Communications in Medicine. http://medical.nema.org/

DEC: Device Enterprise Communication.

DOB: Date of Birth.

DOC: Device Observation Client.

DOR: Device Observation Reporter.

Dotted notation: a string in the form k.l.m.n[.o] (where k..o are integer ordinals mapping an object within a device: Medical Device System (MDS),Virtual Medical Device (VMD),Channel, Metric, and optional Facet), used in PCD -- specifically in the OBX-4 Sub-id field, to associate an observation with its unique 'address' within the device.

ECG: Electrocardiogram.

EEG: Electroencephalogram.

EHR: Electronic Health Record.

eMAR: electronic Medication Administration Record

eMPI: Enterprise Master Patient Index.

EMR: Electronic Medical Record.

Episodic: occurring at unpredictable times. Similar in meaning to aperiodic, except that aperiodic is generally applied to observations and episodic can be applied to any sort of happening or event, including patient physiological and device technical alarms.

EUI-64: An 8-byte hexadecimal Extended Unique Identifier number defined by the IEEE, uniquely identifying a particular instance of a device. It begins with a 3- or 4-byte company id assigned to the manufacturer of a device by the IEEE Registration Authority. The rest of the bits are assigned by the manufacturer in such a way as to insure no two individual devices have the same EUI-64. It is one way used in PCD messaging to uniquely identify a device or system.

Event: in UML modeling, an occurrence at a definite time that is significant in the analysis of the system under study.

Expected Actions: Actions which should occur as the result of a trigger event.

General purpose infusion pump: a pump used to infuse fluids intravenously in a wide variety of clinical settings. Differentiated from specialty infusion pumps, which are used for a specific purpose or in a specific setting, such as PCA (patient-controlled analgesia) or syringe pumps.

HIMSS: Healthcare Information and Management Systems Society.

HIS: Hospital Information System.

HL7: Health Level 7. http://www.hl7.org/

IHE: Integrating the Healthcare Enterprise.

IEEE: Institute of Electrical and Electronics Engineers. http://www.ieee.org

IETF: Internet Engineering Task Force. http://www.ietf.org/

Interaction Diagram: A diagram that depicts data flow and sequencing of events.

MDC: Medical Device Communication – the general name for the suite of standards in ISO/IEEE 11073 defining communications protocols for patient care devices.

MDS: Medical Device System. The object in ISO/IEEE 11073 representing a whole medical device. It contains Virtual Medical Devices representing subsystems.

MPI: Master Patient Index – see eMPI.

Interaction Diagram: A diagram that depicts data flow and sequencing of events.

IT: Information Technology.

MPI: Master Patient Index.

MRN: Medicare Record Number or Medical Record Number.

NEMA: National Electrical Manufacturers Association.

NTP: Network Time Protocol. This is the standard Internet protocol for synchronizing computer clocks. The web site http://www.ntp.org provides extensive background documentation at the introductory and expert level on how to synchronize computers.

Observation: In HL7 generally, patient-oriented clinical data. In IHE PCD, this category is enlarged to include, in addition to patient physiological data (clinical measurements), patient care device data supporting the communication of patient-oriented clinical data such as patient and device identifying data, device technical status data, alarms and device settings. These are all reported using HL7 communications patterns established for clinical data in HL7 version 2.6 Chapter 7, Observations.

OID: Object Identifier. An open-ended system with a hierarchical scheme of assigning authorities, with a dotted series of numbers where each number represents an assigning authority in the hierarchy – each assigning authority can assign numbers to another, lower-level authority. An example is 2.16.840.1.113883 (joint-iso-itu-t.country.us.organization.hl7). IHE PCD has assigns OIDs starting from 1.3.6.1.4.1.19376.1.6. The IEEE 11073 nomenclature has the OID 1.2.840.10004.1.1.1.0.0.1. OIDs are the preferred unique identification scheme in the HL7 organization and are widely used in HL7 and other healthcare IT contexts to provide a durable globally unique numeric identification scheme.

PCD: Patient care device.

Physiologic: Mechanical, physical, and biochemical functions of living organisms.

Piggyback: a medication, typically administered intermittently in a small volume of fluid that runs into a maintenance line. While a piggyback is infusing, the maintenance fluid is stopped.

When the piggyback has completed, the pump will automatically restart the maintenance fluid. The advantage to piggyback administration is that it does not require the patient to have multiple IV sites

RFC: Request for comment. http://www.rfc-editor.org/

RFID: Radio frequency identification.

Role: The part played by an actor in a use case.

RSNA: Radiological Society of North America. http://www.rsna.org/

Safety Infusion System (Smart Pump System): infusion devices designed to reduce the error rates associated with infusions. Smart pumps typically communicate through a server or gateway and have one or more of the following features:

- Ability to check programmed doses against pre-configured limits in an onboard drug library
- Ability to read infusion parameters from RFID tags or barcodes
- Ability to send and receive infusion parameters via a wired or wireless network

Scope: A brief description of the transaction.

Settings: Device operational options that may be reported through the device's communications interface and in some cases may be changed through the communications interface. Changeable settings may include options that alter alarm operation by, for example, setting alarm limits for measurements, but also settings that affect actual therapy delivered to the patient, such as ventilator operational settings. Obviously the latter category requires a very exacting level of risk analysis and mitigation.

SNTP: Simple Network Time Protocol. This is a reduced accuracy version of NTP. The protocol fields are the same, but the data values and algorithms used are greatly reduced accuracy so that it can be implemented on limited capacity systems.

Subscribe: Make a request that only messages satisfying specific predicates be sent to the subscriber.

Trigger Event: An event such as the reception of a message or completion of a process which causes another action to occur.

UID: Universal Identifier

Unsolicited: Within the context of HL7 when the transfer of information is initiated by the application system that deals with the triggering event, the transaction is termed an unsolicited update.

Universal ID: Used in HL7 documents for recognized schemes of unique identification that are stable over time. Each UID must belong to one of a set of specifically enumerated types, mostly defined by organizations other than HL7. The HL7 designation of these schemes are somewhat idiosyncratic and confused, in some cases differing from common usage – see notes below. Uses of Universal ID schemes in HL7 must follow syntactic rules of the particular scheme.

Schemes listed by HL7 in the Universal ID type (table 301) include:

- DNS (Domain Name Service names or IP addresses) (undesirable for most PCD uses because not stable over time)
- UUID (the DCE Universal Unique Identifier, also known as GUID and familiar from use in the Microsoft COM Implementation) (undesirable for PCD because they cannot readily be tracked to any assigning authority)
- "ISO" (Object ID, the common "OID"). See glossary entry for Object Identifier.
- URI (Uniform Resource Identifier) – this is a "scheme of schemes" that includes the familiar internet URL scheme and the URN scheme that does not necessarily map to an internet address and is extremely general actually including some of the other schemes HL7 mentions, such as OID and GUID. URNs for these systems are simply urn:oid:<the oid> and urn:uuid:<the UUID>, respectively.

In addition, at the request of the IHE Patient Care Device domain, future versions of HL7 will recognize EUI-64 (see its glossary entry) as a Universal ID type.

Universal ID systems play an important role in PCD, identifying unique instances of devices, software, and information systems, and services. They are used in the HL7 Entity Identifier (EI) and Hierarchic Designator (HD) data types; see especially Sending and Receiving Application fields in the MSH segment, Placer and Filler IDs and Universal Services IDs in the OBR segment, and Equipment Identifier in OBX segments.

Use Case: A description of a unit of functionality of a system being modeled, from the point of view of external actors on the system.

UTC: Universal Coordinated Time. This is the replacement for GMT. It defines a reference time base that is internationally standardized and maintained.

Validated: PCD data which has been marked as correct by a caregiver.

VMD: Virtual Medical Device. The modeling object in ISO/IEEE 1073 representing a subsystem of a Medical Device System, such as an invasive pressure module in a physiological monitor. It in turn contains Channel objects.

W3C: World Wide Web Consortium http://www.w3.org/

