Hillrom Digital Health Gateway

HL7 Interface Specification
LAB01457 rev 2

Table of Contents

Introduction

The Gateway Software provides a simple interface that allows information hosts (third party software applications) to communicate with Hillrom Welch Allyn Vital Signs Monitors devices. It achieves this by having the ability to translate data to a format that is understood by the third-party application which the Gateway Software can subsequently send to the third-party application via TCP or HTTP.

Similarly, Gateway Software has the ability to receive & translate third party data formats.

The integration consists of several transaction types:
- ADT
- Patient demographics Query / Response
- Send Vitals ORU readings

Communication between the Gateway Software and the HL7 host system is via TCP/IP sockets, via dedicated ports.

HL7 version 2.6 shall be the messaging standard between the Gateway Software and the HL7 host system.

Purpose

This document contains specifications intended as a guide for software and HL7 Interface developers who understand HL7 Interface requirements. It explains the Digital Health Gateway's (DHG) Enterprise Gateway Interface requirements. This document shall be used to assist software and HL7 Interface developers and allow these technical personnel to develop the HL7 interface between a facility-controlled Hospital Information System (HIS) and the DHG's Enterprise Gateway.

Scope

The scope of this interface specification is to define the messaging between the Digital Health Gateway's Enterprise Gateway and a HL7 host system to achieve the following bidirectional communication:

1. Send vitals data from the vitals device to the HL7 host system

   - ORU

2. Listen for incoming HL7 messages from the HL7 host system

   - ADT
   - ORU
   - ORM
   - OMG
   - OMP
   - PPR

Definitions

The following table lists acronyms and terms that are used throughout this document. The names and acronyms for software items within the system are introduced in the sections which describe them.

Term	Definition
Gateway Software	A software application that is capable of receiving data from a device and converting the data to HL7 messages and then transmitting that data via a TCP/IP socket. Examples include: CDIS-NCE, Connex CSK, Connex VM and/or Connex CS. This specification specifies the Digital Health Gateway.
HL7	Health Level 7 - A framework for the exchange, integration, sharing, and retrieval of electronic health information
Host HL7 System	Software System that is connected to the host side of the gateway software.
IHE	Integrating the Healthcare Enterprise. IHE is an initiative by groups of healthcare professionals and industry to improve the way computer systems in healthcare share information. IHE promotes the coordinated use of established standards such as DICOM and HL7 to address specific clinical needs in support of optimal patient care. Systems developed in accordance with IHE communicate with one another better, are easier to implement and enable care providers to use information more effectively.
Vitals Device	A generic name for CVSM, CIWS, and future vitals devices. The following Welch Allyn devices are compatible with Zenith: CIWS, CSM, CVSM 1.7 or greater.
Digital Health Gateway (DHG)	A software system that provides the functionality described in this document.
ADT	Admit, Discharge, Transfer
EG	Enterprise Gateway

Product Affected

Digital Health Platform: Digital Health Gateway

HL7 Message Formats

All HL7 messages (including patient ID and patient list) are based on IHE HL7 standards.
The specifications are available by clicking the following link: IHE specification and then select Patient Care Device (PCD).
The specification for Alarm Reporting is available by clicking the following link: IHE Alarm Communication Management
Optionality (Usage) column – defines if this is a Hillrom Required, Optional or Conditional component of the HL7 Segment/Field.
"R" = Required. This must be present in the HL7 Message.
"O" = Optional. This can be present in the HL7 Message.
"C" = Conditional. This may be present in the HL7 Message.

Message Segments Detailed Descriptions

This section describes the different HL7 message segments.

MSH Segment

Example:
MSH|^~\&|Clarity|Hillrom|EMR|HIS|20140308152017+0500||
ORU^R01^ORU_R01|20140308202025103001270212|P|2.6|||AL|NE|||||
IHE_PCD_ORU_R01^IHE_PCD^1.3.6.1.4.1.19376.1.6.1.1.1^ISO

Field	Description	Usage	Comment OR Example
MSH-1	Field Separator	R	|
MSH-2	Encoding Characters	R	^~\&
MSH-3	Sending Application	R	Clarity
MSH-4	Sending Facility	R	Hillrom
MSH-5	Receiving Application	R	Generic Name for Receiving Application EMR (Clarity to EMR) Clarity (EMR to Clarity)
MSH-6	Receiving Facility	R	Generic Name for Receiving Facility HIS (Clarity to EMR) Clarity (EMR to Clarity)
MSH-7	Date/Time of Message	R	Format: YYYYMMDDHHMMSS+/-HHMM Local Date/Time +/- Timezone offset of the server date/time in HH (hours) and MM (minutes) from UTC time
MSH-9	Message Type	R	<Message Code (ID)> ^ <Trigger Event (ID)> ^ <Message Structure (ID)> Example: ORU^R01^ORU_R01

Field	Description	Usage	Comment OR Example
MSH-10	Message Control ID	R	An identifier that uniquely identifies the message Usage: Reading Date/Time & Unique Number
MSH-11	Processing ID	R	P for Production. D for Debugging
MSH-12	Version ID	R	HL7 Version; Usage: 2.6
MSH-15	Accept Acknowledgement Type	R	AL
MSH-16	Application Acknowledgement Type	R	NE
MSH-21	Message Profile Identifier	R	<Entity Identifier> ^ <Namespace ID> ^ <Universal ID> ^ <Universal ID Type> Usage: IHE_PCD_ORU_R01^ IHE_PCD^1.3.6.1.4.1.19376.1.6.1.1.1^ISO

PID Segment

Example: PID|||147852369||Callaghan^Harold^P||19451225|M

Field	Description	Required	Comments
PID-3	Patient Identifier	R	Can be displayed on the device
PID-5-1	Last Name or Surname	R	Can be displayed on the device and can be sent in the ORU result if a patient query or patient list or manually entered.
PID-5-2	First Name	R	Can be displayed on the device and can be sent in the ORU result if a patient query or patient list or manually entered.
PID-5-3	Middle Initial	O	Can be displayed on the device
PID-7	Date of Birth	R	Format: YYYYMMDD Not displayed on the device, but can be sent as part of the ORU result if a patient query or patient list has been done before ORU sent.
PID-8	Gender	R	M=male; F=female Not displayed on the device, but can be sent as part of the ORU result if a patient query or patient list has been done before ORU sent.

PV1 Patient Visit Segment

Example: PV1||I|MedSurg-3^Room^Bed

Field	Description	Required	Comments
PV1-2	Patient Class	R	I = Inpatient
PV1-3	Assigned Location	R	Can be displayed on the device Data comes from device's fields for:

Field	Description	Required	Comments
			LocationID (PV1-3.1) Room (PV1-3.2) Bed fields (PV1-3.3) Example: LocationID^Room^Bed

OBR Observation Segment

Example: OBR|||20140308152017213|S^S|||20140308202025
||||12398756||||||||||||||||F|||||||||12398756||||||||||

Field	Description	Required	Comments
OBR-3	Filler Order Number	R	ORU: Filled with local time of when the message was processed. ACM: 3.1 = The source description of where the value in alarm comes from; 3.2 = not used; 3.3 = Date/Time of when the alarm tripped.
OBR-4	Universal Service ID	R	Type of data in the ORU message where: S = Episodic data; C = Continuous See table below for the OBR-4 value usage
OBR-7	Observation Date/Time	R	Format: YYYYMMDDHHMMSS+HHMM UTC Date/Time +/- Timezone offset in HH (hours) and MM (minutes) from UTC time. NOTE: always +0000 since parameter date/time is reported in UTC
OBR-10	Collector Identifier	O	Usage: Clinician ID
OBR-25	Result Status	R	Confirmed (F) or Unconfirmed (R) See table below for the OBR-25 value usage
OBR-29	Parent Number	R	ACM only: The source description of where the value in alarm comes from. This field defines internal object and field that tripped the alarm.
OBR-34	Technician	O	Usage: Clinician ID

OBX Observation Segment - Outbound Data

Example: OBX|1|NM|150021^MDC_PRESS_BLD_NONINV_SYS^MDC|1.0.1.1|100|
266016^MDC_DIM_MMHG^MDC||||||F|||20140308202025||12398756|| 103001270212^PMP^CVSM
6000 Series||0|0|0

Field	Description	Required	Comments
OBX-1	Set ID	R	Sequence Number of the OBX in the message

Field	Description	Required	Comments
OBX-2	Value Type	R	Examples usage: NM (Numeric); ST (String)
OBX-3	Observation Identifier	R	A triplet describing the value that is being sent. See OBX-3 table below
OBX-4	Observation Sub-ID	R	See OBX-4 table below
OBX-5	Observation Value	C	The value associated with OBX-3, if one is provided.
OBX-6	Units	R	Describes units for value in OBX-5 See OBX-6 table below
OBX-8	Abnormal Flags	O	Measurement alarm value See OBX-8 table below
OBX-11	Observation Result Status	R	F = Confirmed; R = Unconfirmed See table below for the OBX-11 value usage
OBX-14	Date/Time of the Observation	R	Format: YYYYMMDDHHMMSS+HHMM UTC Date/Time +/- Timezone offset in HH (hours) and MM (minutes) from UTC time. NOTE: always +0000 since parameter date/time is reported in UTC
OBX-16	Responsible Observer	O	Usage: Clinician ID
OBX-17	Observation Method	O	Method and Source of the parameter. Format = Method^Source Method = one of (Blank; Manual; Device) See source values in OBX-17 table below
OBX-18	Equipment Instance Identifier	O	Description of the system sending the data. Contains: 18.1 - Entity Identifier – length 199 18.2 - Namespace ID – length 20 (Optional) 18.3 - Universal ID – length 199 (Optional) Example: SerialNumber^ModelName^ModelNumber
OBX-20	Observation Site (Modifier Field 1)	O	NIBP: Cuff Site TEMPERATURE: Mode SpO2: O2 Method
OBX-21	Modifier Field 2	O	NIBP: Cuff Size – See OBX-21 table below SpO2: O2 Flow Rate (1 - 20 liters, increments of 1)
OBX-22	Modifier Field 3	O	NIBP: Patient Position – See OBX-22 table below SpO2: O2 Concentration (21 - 100%, increments of 1%)
OBX-23	Modifier Field 4	O	SpO2: Measurement Site – See OBX-23 table below
OBX-24+	Custom Data Modifiers	O	When custom data modifiers are specified for an existing parameter, a variable number of modifiers will be appended to the end of the OBX segment,

Field	Description	Required	Comments
			following the static modifiers for the parameter. These custom modifiers will always begin at OBX-24, regardless of how many standard modifiers are associated with the parameter.

Value	OBX-3 - Observation Identifier
NIBP SYS	150021^MDC_PRESS_BLD_NONINV_SYS^MDC
NIBP DIA	150022^MDC_PRESS_BLD_NONINV_DIA^MDC
NIBP MAP	150023^MDC_PRESS_BLD_NONINV_MEAN^MDC
Temperature	150344^MDC_TEMP^MDC
SpO2 SAT	150456^MDC_PULS_OXIM_SAT_O2^MDC
Heart Rate	149546^MDC_PULS_RATE_NON_INV^MDC
Weight	68063^MDC_ATTR_PT_WEIGHT^MDC
Height	68060^MDC_ATTR_PT_HEIGHT^MDC
Respiration Rate	151562^MDC_RESP_RATE^MDC
Pain	PAIN^PAIN_LEVEL^L
BMI	BMI^BMI^L
SpHb	64156^SPHB_VALUE^L
etCO2	151728^MDC_AWAY_CO2_ET^MDC
FiCO2	151729^MDC_AWAY_CO2_FI^MDC
IPI	64158^MDC_INTEGRATED_PULM_INDEX^MDC
Custom Data Parameter/Score/Calculation	<Custom Data Name>

*The <Custom Alarm Name> for tech alarms are generated based on the WACP data and naming scheme. Each alarm is guaranteed to be unique. See Appendix A for a full list of explicit alarm codes.

Value	OBX-4 - Observation Sub-ID
NIBP SYS	1.0.1.1
NIBP DIA	1.0.1.2
NIBP MAP	1.0.1.3
Temperature	1.10.1.1
SpO2 SAT	1.1.1.12
Heart Rate	1.0.0.1
Weight	1.1.2.209
Height	1.1.2.25
Respiration Rate	1.1.1.25

Value	OBX-4 - Observation Sub-ID
Pain	0.0.0.0
BMI	0.0.0.0
SpHb	0.0.0.0
etCO2	0.0.0.0
FiCO2	0.0.0.0
IPI	0.0.0.0
Custom Data Parameter/Score/Calculation	0.0.0.0

Value	OBX-6 – Units
NIBP	266016^MDC_DIM_MMHG^MDC
Temperature	268192^MDC_DIM_DEGC^MDC OR 266560^MDC_DIM_FAHR^MDC
SpO2 SAT	262688^MDC_DIM_PERCENT^MDC
Heart Rate	264864^MDC_DIM_BEAT_PER_MIN^MDC
Weight	263875^MDC_DIM_KILO_G^MDC OR 263904^MDC_DIM_LB^MDC
Height	263441^MDC_DIM_CENTI_M^MDC OR 263520^MDC_DIM_INCH^MDC
Respiration Rate	264928^MDC_DIM_RESP_PER_MIN^MDC
Pain	N/A
BMI	N/A
SpHb	266866^MDC_DIM_MILLI_MOLE_PER_L^MDC
EtCO2	266016^MDC_DIM_MMHG^MDC
FiCO2	266016^MDC_DIM_MMHG^MDC
IPI	N/A
Custom Data Parameter/Score/Calculation	<Custom Data Units>

The following table specifies the relation between Observation Result status values in ORU messages, based on different profiles (modes) of the device.

Device Profile	Measurement Type	Outbound Interface	OBR-4	OBR-25	OBX-11
Intervals	Episodic	Confirmed	S	F	F
Intervals	Intervals	Unconfirmed	S	R	R

Spot check	Episodic	Confirmed	S	F	F

Value	OBX-17 – Sources Values
NIBP	Blank; CVSM; MODG
Temperature	Blank; SureTemp; SureTemp_Plus; Braun_Pro4000; Braun_Pro6000
SpO2	Blank; Nonin; Nellcor_MP205; Nellcor_MP506; Nellcor_NELL3; Nellcor_NELL1; Masimo_MS11; Masimo_MS2011; Masimo_MX
Heart Rate	Blank; NIBP; SPO2; ECG; Bed_Sensor; Chair_Sensor
Weight	Blank
Height	Blank
Respiration Rate	Blank; Respiration; CO2; ECG; Bed_Sensor; Chair_Sensor
Pain	Blank
BMI	Blank
SpHb	Blank; Masimo_MX
EtCO2; FiCO2; IPI	Blank
Custom Data Parameter/Score/Calculation	Blank

Device Selection	OBX-20 – Cuff Site Values
None	Blank
Unknown	Unknown
L Arm	LA
R Arm	RA
L Leg	LL
R Leg	RL

Device Selection	OBX-20 – Temperature Mode
None	Blank
Unknown	Unknown
Oral	Oral
Rectal	Rectal
Pediatric Axillary	Ped_Axillary
Adult Axillary	Adult_Axillary
Tympanic	Tympanic

Device Selection	OBX-20 – SpO2 O2 Method
None	Blank
Aerosol / humidified mask	Aerosol/humidified mask
Face tent	Face Tent
Mask	Mask
Nasal cannula	Nasal Cannula
Nonrebreather	Nonrebreather
Partial rebreather	Partial Rebreather
T-piece	T Piece
Tracheostomy collar	Tracheostomy Collar
Ventilator	Ventilator
Venturi mask	Venturi Mask
Room air	Room Air
Oxymizer	Oxymizer

Device Selection	OBX-21 – NIBP Cuff Size
None	Blank
Unknown	Unknown
Neo 1	Neo 1
Neo 2	Neo 2
Neo 3	Neo 3
Neo 4	Neo 4
Neo 5	Neo 5
Small infant	Small Infant
Infant	Infant
Small child	Small Child
Child	Child
Small adult	Small Adult
Adult	Adult
Adult long	Adult Long
Large adult	Large Adult
Large adult long	Large Adult Long
Thigh	Thigh

Device Selection	OBX-22 – NIBP Patient Position
None	Blank
Unknown	Unknown
Lying	Lying
Sitting	Sitting
Standing	Standing

Device Selection	OBX-23 – SpO2 Measurement Site
None	Blank
Ear	Ear
Finger	Finger
Toe	Toe
Forehead	Forehead

Patient Query

This section describes the request/response segments of patient query.

Query Request

The patient query that is sent from the Hillrom Welch Allyn Vitals Device to the Digital Health Gateway uses the IHE compliant QBP^Q22 query message type. This message corresponds to Transaction ITI-21 of the IHE Technical Framework.

The following is a sample of the message:

MSH|^~\&|CDIS-NCE|WelchAllyn|EMR|HIS|20140123094459-0500||QBP^Q22^QBP_Q21|20140123094459728|P|2.6|||AL|NE
QPD|IHE PDQ Query|20140123094459728|@PID.3.1^135798642~@PID3.4^EMR
RCP|I|1RD

The value in the QPD segment (135798642) is the Patient ID that is either scanned or manually entered into the device. This value will be used by the Digital Health Gateway to search for the patient/return the demographics of a single patient.

Note that RCP-2.1 is set to 1 to indicate that at most only one patient should be returned in the result.

Response

The patient query response that is sent from the Digital Health Gateway uses the IHE compliant RSP^K22 message type. This message corresponds to Transaction ITI-21 of the IHE Technical Framework.

The following is a sample of the message:

MSH|^~\&|CDIS-NCE|WelchAllyn|EMR|HIS|20140123094559-0500||RSP^K22|20140123094559728|P|2.6|||AL|NE
MSA|AA|20140122123838853
QAK|20140122123838853|OK
QPD|PatientQuery|20140123094459728|@PID.3.1^135798642
PID|||135798642||Eastwood^Clint||19780423|M

If no patient can be found, the RSP^K22 message should be returned but have no PID segment, or have a code in MSA-1 that is not AA, e.g. AE:

MSH|^~\&|CDIS-NCE|WelchAllyn|EMR|HIS|20140123094559-0500||RSP^K22|20140123094559728|P|2.6|||AL|NE
MSA|AE|20140122123838853
QAK|20140122123838853|OK
QPD|PatientQuery|20140123094459728|@PID.3.1^135798642

Vitals Data Send

The message will use the following message segments: MSH, PID, PV1, OBR and OBX.

Outbound Example

The format of the Vitals data send shall be a HL7 ORU message.

MSH|^~\&|CDIS-NCE|WelchAllyn|EMR|HIS|20140308152017-0500||ORU^R01^ORU_R01|201403082020251030010270212|P|2.6|||AL|NE|||||
IHE_PCD_ORU_R01^IHE_PCD^1.3.6.1.4.1.19376.1.6.1.1.1^ISO
PID|||147852369||Keegan^Chris^M^^^^L|||M
PV1||I|Wing-a^101^2
OBR|||20140308152017213|S^S|||20140308202025+0000||||||||||||||||||F||||||||||||||||||||
OBX|1|NM|150021^MDC_PRESS_BLD_NONINV_SYS^MDC|1.0.1.1|100|266016^MDC_DIM_MMHG^MDC||||||F|||20140308202025+0000||||103001270212^PMP^VSM 6000 Series||0|0|0
OBX|2|NM|150022^MDC_PRESS_BLD_NONINV_DIA^MDC|1.0.1.2|50|266016^MDC_DIM_MMHG^MDC||||||F|||20140308202025+0000||||103001270212^PMP^VSM 6000 Series||0|0|0
OBX|3|NM|150023^MDC_PRESS_BLD_NONINV_MEAN^MDC|1.0.1.3|0|266016^MDC_DIM_MMHG^MDC||||||F|||20140308202025+0000||||103001270212^PMP^VSM 6000 Series||0|0|0
OBX|4|NM|150344^MDC_TEMP^MDC|1.10.1.1|36.9683|268192^MDC_DIM_DEGC^MDC|||||F|||20140308202025+0000||||103001270212^PMP^VSM 6000 Series||0

OBX|5|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|1.1.1.12|99|262688^MDC_DIM_PERCENT^MDC|| |||F|||20140308202025+0000|||||103001270212^PMP^VSM 6000 Series||0|0|0
OBX|6|NM|149546^MDC_PULS_RATE_NON_INV^MDC|1.0.0.1|60|264864^MDC_DIM_BEAT_PER_MIN^ MDC|||||F|||20140308202025+0000|||||103001270212^PMP^VSM 6000 Series||0
OBX|7|NM|68063^MDC_ATTR_PT_WEIGHT^MDC|1.1.2.209|68|263875^MDC_DIM_KILO_G^MDC|||||F |||20140308202025+0000|||||103001270212^PMP^VSM 6000 Series||
OBX|8|NM|68060^MDC_ATTR_PT_HEIGHT^MDC|1.1.2.25|177.8|263441^MDC_DIM_CENTI_M^MDC||| ||F|||20140308202025+0000|||||103001270212^PMP^VSM 6000 Series||
OBX|9|NM|151562^MDC_RESP_RATE^MDC|1.1.1.25|15|264928^MDC_DIM_RESP_PER_MIN^MDC |||||F|||20140308202025+0000|||||103001270212^PMP^VSM 6000 Series||
OBX|10|NM|PAIN^PAIN_LEVEL^L|1|6|||||||F|||20140308202025+0000|||||103001270212^PMP^VSM 6000 Series||
OBX|11|NM|BMI^BMI^L|1|39|||||||F|||20140308202025+0000|||||103001270212^PMP^VSM 6000 Series||

Custom Modifiers

When the modifier is associated with vitals data that is already represented by an OBX segment, the modifiers will be appended to the end of the OBX segment for that parameter. The standard modifier fields will start in OBX-20 for that data element, while custom modifier fields will always start at OBX-24, regardless of the number of standard modifiers that exist.. The modifiers will then extend into subsequent OBX fields, with a new field for each individual modifier. Custom modifiers are variable in number, and there is no guaranteed order to the modifiers. Custom modifiers are therefore represented as key^value pairs, and the consuming application must examine the key^value pairs to determine how they are handled. When generating the OBX field for a custom modifier, the following rules apply:

1. The parameter that is associated with the modifier is defined by the "Modifies" attribute.
2. The modifier key name is in the "HISId" attribute
3. When the modifier type is defined as "Alphanumeric" or "List", the selected value is in the "ItemHISId" attribute.
4. When the modifier type is defined as "Integer" or "Decimal", the value is located in the direct numeric value entered by the user.

The OBX segments containing the custom modifier would appear as:

OBX|1|NM|150021^MDC_PRESS_BLD_NONINV_SYS^MDC|1.0.1.1|120|266016^MDC_DIM_MMHG^MDC |||||F|||20150304205705+0000|||Manual^|100000584014^Connex Spot Monitor^1000||NIBPDevice^MANUAL|NIBPPosition^SITTING|NIBPLocation^LEFT_ARM|NIBPActivity^MO DERATE
OBX|2|NM|150022^MDC_PRESS_BLD_NONINV_DIA^MDC|1.0.1.2|80|266016^MDC_DIM_MMHG^MDC| |||||F|||20150304205705+0000|||Manual^|100000584014^Connex Spot Monitor^1000||NIBPDevice^MANUAL|NIBPPosition^SITTING|NIBPLocation^LEFT_ARM|NIBPActivity^MO DERATE

OBX|3|NM|150023^MDC_PRESS_BLD_NONINV_MEAN^MDC|1.0.1.3|0|266016^MDC_DIM_MMHG^MDC|||||F|||20150304205705+0000|||Manual^|100000584014^Connex Spot Monitor^1000||NIBPDevice^MANUAL|NIBPPosition^SITTING|NIBPLocation^LEFT_ARM|NIBPActivity^MODERATE

Custom Parameters

Any custom parameters defined for a device will be represented by a new OBX segment. These OBX segments will appear in the output HL7 data in the same order as they appear within the source data from the device. This means the order of parameters is dynamic, and no specific order should be expected or relied upon. When generating an OBX segment for a custom parameter, the OBX fields are generated by the following mapping:

Field	Description	Comments
OBX-2	Value Type	NM ("Type" attribute = "Integer" or "Decimal"); ST ("Type" attribute = "Alphanumeric" or "List")
OBX-3	Observation Identifier	"HISId" attribute
OBX-4	Observation Sub-ID	0.0.0.0
OBX-5	Observation Value	When OBX-2 is NM, the value is located in the direct numeric value entered by the user. When OBX-2 is ST, the selected value is in the "ItemHISId" attribute. If no "ItemHISId" attribute is defined for the selection, the direct value associated with the parameter will be used instead.
OBX-6	Units	"Unit" attribute

The OBX segment containing the custom parameter would appear as:
OBX|1|NM|BloodSugar|0.0.0.0|203.0|mg/dL|||||F|||20150304205727+0000|||Manual^|100000584014^Connex Spot Monitor^1000|

Custom Scores/Calculations

Each parameter, intermediate score and the overall score will have their own OBX segment. These OBX segments will appear in the output HL7 data in the same order as they appear within the source data from the device. This means the order of scores/calculations is dynamic, and no specific order should be expected or relied upon. When generating an OBX segment for a custom score/calculation, the OBX fields are generated by the following mapping:

Field	Description	Comments
OBX-2	Value Type	NM ("Type" attribute = "Integer" or "Decimal"); ST ("Type" attribute = "Alphanumeric" or "List")
OBX-3	Observation Identifier	User selection/entry <"CalcName" attribute>.<"HISId" attribute >.<Name> Calculated score value <"CalcName" attribute >.<"HISId" attribute >.<Value> Rank text value <"CalcName" attribute >.<"HISId" attribute >.<Rank> Color associated with rank <"CalcName" attribute >.<"HISId" attribute>.<Color>
OBX-4	Observation Sub-ID	0.0.0.0
OBX-5	Observation Value	When OBX-2 is NM, the selected value is located in the direct numeric value entered by the user When OBX-2 is ST, the selected value is located in the "ItemHISId" attribute
OBX-6	Units	"UnitHISId" attribute

The OBX segment containing the custom scores / calculations would appear as:

OBX|18|ST|Transform scoring.AVPUScoring.Name|0.0.0.0|Unresponsive||||||F|||20180925194533+0000||321412|Manual^|100031732717^Connex Spot Monitor^73MT||
OBX|19|NM|Transform scoring.AVPUScoring.Value|0.0.0.0|4||||||F|||20180925194533+0000||321412|Manual^|100031732717^Connex Spot Monitor^73MT||
OBX|20|ST|Transform scoring.AVPUScoring.Rank|0.0.0.0|HSO||||||F|||20180925194533+0000||321412|Manual^|100031732717^Connex Spot Monitor^73MT||

OBX|21|ST|Transform scoring.AVPUScoring.Color|0.0.0.0|HSOO||||||F|||20180925194533+0000||321412|Manual^|100031732717^Connex Spot Monitor^73MT||

Response
In response to a vitals data send, the Digital Health Gateway shall return back an ACK/NACK type HL7 message:

> An ACK to signify successful processing
> A NACK to signify the processing was not successful

The Gateway Software can then send an equivalent ACK/NACK message back to the device. An ACK message shall have the following structure:

MSH|^~\&|EMR|HIS|CDIS-NCE|WelchAllyn|20131016055244-0500||ACK^A01|20131016055248|P|2.6|||AL|NE
MSA|AA|20131004110527014

A NACK message shall have a similar structure as an ACK message; the only difference being the MSA 1 field is set to AE

MSH|^~\&|EMR|HIS|CDIS-NCE|WelchAllyn|20131016055244-0500||ACK^A01|20131016055248|P|2.6|||AL|NE
MSA|AE|20131004110527014

Vitals HL7 Send to the EMR

This section describes the HL7 interface used to send vital signs data from a Hillrom device to a third party HIS.

Vitals Data

The following fields shall be sent as part of a vitals data sent from a vitals device to the host HL7 system:

- Date/Time of when the reading was saved in the vitals device
- Patient ID
- Patient Last Name
- Patient First Name
- Patient Middle Initial
- Clinician ID
- Device Serial number
- Device Model Name
- Device Location ID
- Blood Pressure – Systolic
- Blood pressure – Diastolic
- Blood pressure – Mean Arterial Pressure
- Heart Rate
- Temperature
- SpO2 Saturation
- Weight
- Height
- Respiration
- Pain
- BMI
- Hemoglobin
- Custom Data Modifiers/Parameters/Scores/Calculations

Where applicable, for each field specified above a unit of measure shall be sent.

The device shall act accordingly when the following response messages are received from the host HL7 system in response to a Vitals send:

- ACK
- NACK

Queries

This section defines the queries that are handled by the Digital Health Gateway.

Patient Query

When a user enters a patient ID/number either manually or by a bar code scanner, the vitals device shall send a patient query message to the Digital Health Gateway using the patient ID/number as the patient identifier.

When the result (patient details) is returned back from the Digital Health Gateway, the vitals device shall be able to store the following patient information:

- Patient Identifier   (can be displayed in the vitals device)
- Last Name   (can be displayed in the vitals device)
- First Name   (can be displayed in the vitals device)
- Middle Initial   (can be displayed in the vitals device)
- Gender   (is stored in the vitals device, but not displayed)
- Date of Birth   (is stored in the vitals device, but not displayed)

HL7 Interface

This section describes the different interfaces that the Digital Health Gateway supports over HL7. This includes support for ADT messages. The full list of supported messages and segments is defined below.

Supported HL7 Messages
ADT
ORU
ORM
OMG
OMP
PPR

Supported HL7 Segments
MSH
PID
PV1
ORC
OBR
OBX
NTE
RXE
RXO
RXC
PR1
ROL
PRB

Admit, Discharge, Transfer

This section describes the messages and formats of Admit, Discharge and Transfer messages.

Supported ADT Trigger Events

This section contains a list of supported HL7 messages, and which components can receive each message.

NOTE: Digital Health Gateway (DGH) does not support A60.

HL7 ADT Message Support

ADT Message		DHG	Voalte	NaviCare
A01	Admit/visit notification	Yes	Yes	Yes
A02	Transfer a patient	Yes	Yes	Yes
A03	Discharge/end visit	Yes	Yes	Yes
A04	Register a patient	Yes	Yes	No
A05	Pre-admit a patient	Yes	Yes	No
A06	Change an outpatient to an inpatient	Yes	Yes	Yes
A07	Change an inpatient to an outpatient	Yes	Yes	Yes
A08	Update patient information	Yes	Yes	Yes
A09	Patient departing – tracking	Yes	No	No
A10	Patient arriving – tracking	Yes	No	No
A11	Cancel admit/visit notification	Yes	Yes	No
A12	Cancel transfer	Yes	Yes	Yes
A13	Cancel discharge/end visit	Yes	Yes	Yes
A17	Swap patients	Yes	No	Yes
A18	Merge patient information	Yes	Yes	Yes
A23	Delete a patient record	Yes	No	No
A28	Add person information	Yes	No	No
A29	Delete person information	Yes	No	No
A30	Merge person information	Yes	No	Yes
A31	Update person information	Yes	No	No
A34	Merge patient information - patient I	Yes	No	Yes
A35	Merge patient information - account only	Yes	No	Yes
A36	Merge patient information - patient ID and account number	Yes	No	Yes
A38	Cancel pre-admit	Yes	No	No
A40	Merge patient - patient identifier list	Yes	No	No
A41	Merge account - patient account num	Yes	No	Yes
A42	Merge visit - visit number	Yes	No	Yes

A43	Move patient information - patient identifier list	Yes	No	Yes
A44	Move account information - patient account number	Yes	No	Yes
A45	Move visit information - visit number	Yes	No	Yes
A47	Change patient identifier list	Yes	No	Yes
A49	Change patient account number	Yes	No	Yes
A50	Change visit number	Yes	No	Yes
A60	Update Adverse Reaction information	No	No	Yes

ADT Patient Identifiers, Patient Locations

ADT messages will work as per HL7 specifications only when standard HL7 patient identifiers are set.

Standard HL7 identifiers are:
- PID-3 (Patient Identifier)
- PID-18 (Patient Account Number)
- PV1-19 (Visit Number)

Standard HL7 source and target identifiers used for merge and change messages:

Target Identifier	Source Identifier
PID-3 (Patient Identifier)	MRG-1 (Prior Patient Identifier)
PID-18 (Patient Account Number)	MRG-3 (Prior Account Number)
PV1-19 (Visit Number)	MRG-5 (Prior Visit Number)

- Patient Identifiers

Enterprise Gateway requires a visit number and one unique identifier to identify a patient and track a patient, typically Patient Identifier (PID-3) and/or an Account identifier (PV1-19).

Here is an example of an ADT message that meets the minimum HL7 specifications. This is an HL7 version 2.5, ADT A01 Message.

EXAMPLE 1
MSH|^~\&|||||20120629092011||ADT^A01|MESSAGEIDA01-1|P|2.5||||||
EVN||20120521|||||
PID|||1888881||Male^One|||||||||||||||||||||||||||||||||||||||||||||
PV1||I|||||||||||||||||||||||||||||||||||||||||||||||||||||||||||||

In Example 1, the HL7 message is missing two additional fields required by PV1-3-1 and PV1-19 to be populated. Example 2 includes a visit identifier (PV1-19) and location information (PV1-3-1).

EXAMPLE 2
MSH|^~\&||||||20120629092011||ADT^A01|MESSAGEIDA01-1|P|2.5|||||||
EVN||20120521|||||
PID|||1888881||Male^One||||||||||||||||||||||||||||||||||||||||
PV1||I|WA|||||||||||||||44444|||||||||||||||||||||||||||||||||||||

Example 2 contains the minimum amount of data required to process an ADT message.

ADT Patient Location

The key field for identifying patient locations is the PV1-3 field. The elements critical for establishing location include:

PV1 Segment	Location Name	Required	Rules
PV1.3.1	Point of Care	R	This is required to determine which Workstation/Unit will be monitoring each patient.
PV1.3.2	Room	R	If the Room is present, this data will be stored by the CDR.
PV1.3.3	Bed	R	If the Bed is present, this data will be stored by the CDR.
PV1.3.4	Facility	C	If the PV1-3-4 (Facility) is populated in the ADT message with data, this data will be stored by the CDR.
PV1.3.7	Building	C	If the PV1-3-7 (Building) is populated in the ADT message with data, this data will be stored by the CDR.
PV1.3.8	Floor	C	If the PV1-3-8 (Floor) is populated in the ADT message with data, this data will be stored by the CDR.

Results

The Digital Health Gateway can support receiving results from an HL7 EMR.

Messages/Segments: ORC, OBX, and NTE segments can be found within ORU messages with Event R01.

In order to properly receive, there are a few fields of the HL7 message that are required. The Patient that is referenced by the results must have previously been admitted and the following pieces of the HL7 message must be included:

Segment	Description	Required
PV1-3	Location	R

Segment	Description	Required
PID-3	Patient identifier	R
OBX-5	Observation value	R
OBX-3	Observation code	R
OBX-8	Interpretation	O
OBX-7	Reference range	O

The category field will be mapped as 'Laboratory' if a corresponding ORC segment is found. The category field will be mapped as a 'Vital Signs' if no ORC segment is found. See the examples for specific usage.

The interpretation field will be mapped using the OBX-8.1 segment. See the table below for mapping. The system used will be http://hl7.org/fhir/v2/0078.

Value	Description
L	Below low normal
H	Above high normal
LL	Below lower panic limits
HH	Above upper panic limits
<	Below absolute low-off instrument scale
>	Above absolute high-off instrument scale
N	Normal
A	Abnormal
AA	Very abnormal
null	No range defined, or normal ranges don't apply
U	Significant change up
D	Significant change down
B	Better
W	Worse
S	Susceptible
R	Resistant
I	Intermediate
MS	Moderately susceptible
VS	Very susceptible

The referenceRange field will be mapped using the OBX-7.1 segment.
If '-' exists in OBX-7.1, define both low and high limits.
If '>' exists in OBX-7.1, define the low limit.
If '<' exists in OBX-7.1, define the high limit.

Lab Orders

The Digital Health Gateway can support incoming orders for a known patient.

Messages/Segments: OBR segments can be found in OMG messages. Multiple OBR segments are allowed. OBR segments can be found in ORM messages. Multiple OBR segments are allowed within a single ORM message. When using the generic (and deprecated) ORM message, all orders will be processed as laboratory orders that **do not** contain RXE and/or RXO segments.

When assigning the priority of the Order, the Enterprise Gateway makes use of TQ1-9.1, OBR-27.6, or OBR-5.1.

When assigning the authoredOn date, the EG makes use of TQ1-7.1 or OBR-6.1.

The Patient that is referenced by the lab order must exist and the following pieces of the HL7 message must be included:

Segment	Description	Required
OBR-2	Place order number entity identifier	R
OBR-4	Universal Service Identifier	R
OBR-25	Result Status	R
PID-3	Patient identifier	R

Medication Orders

The Digital Health Gateway can support incoming medication orders for a known patient.

Messages/Segments: RXO and ORC segments can be found with OMP messages.
RXO and ORC segments can be found with ORM messages. When using the generic (and deprecated as of HL7 v2.4) ORM message, all orders will be processed as MedicationRequests that **contain** an RXO segment.

Segment	Description	Required
ORC-2	External medication order	R
RXO-1	Medication identifier	R
TQ1-9, ORC-7.6	Priority	O
ORC-5	Status	O
ORC-9	Date/time order was authored	O
ORC-12, RXO-14, RXO-15	Practitioners	O
ORC-16	Reason code	O
PID-3	Patient identifier	R

Segment	Description	Required
PV1-19	Visit identifier	R

Practitioners and Roles

Messages/Segments: ROL segments can be found in ADT messages or PPR messages. PV1-7/8/9/17 segments can be found in ADT or PPR messages.

Segment	Description	Required
ROL-4.1	External practitioner identifier	R
ROL-4.2	Last Name	O
ROL-4.3	First Name	O
ROL-12	Telecom	O
ROL-3	External role identifier	R
ROL-2	Action code	O
ROL-5	Period start	O
ROL-6	Period end	O

Practitioners and their roles can be added using the PV1-7, PV1-8, PV1-9, and PV1-17 fields, as well as ROL segments. Multiple doctors may exist within the allowed PV1 segments.

The external role identifier will be assumed in PV1-7/8/9/17.

The action code should be defined in ROL-2. If the ROL-2 segment is empty, the practitioner will be considered to be active.

PV1-7/8/9/17 doctors will always be considered active.

Problems/Conditions

The Digital Health Gateway can accept diagnoses and problems with a known patient.

DG1 segments can be found in ADT messages. There may be multiple DG1 segments in a single ADT message. PRB segments can be found in PPR messages. There will only be one PRB segment with a PPR message.

Segment	Description	Required
PRB-3	Problem Identifier	R
PRB-26	Problem code	R
PRB-16	Onset	O

Segment	Description	Required
NTE	Notes/Annotations	O
DG1-3	Diagnosis Identifier	R

Procedure

The Digital Health Gateway can receive procedures for a known patient.

Messages/Segments: PR1 segments can be found in ADT messages.

Segment	Description	Required
PID-3	Patient Identifier	R
PV1-19	Visit Identifier	R
PR1-3	Original Code	R
PR1-19	Order Number	R
PR1-12	Performed Date/Time	O
PR1-15	Previous Conditions	O
ROL	Practitioners	O