

Masimo Patient Safetynet™ HL7 Interface Specifications

Version 1.0

August 2013

CAUTION: Federal law restricts this device to sale by or on the order of a physician.
For professional use. See Patient SafetyNet instructions for use for full prescribing information,
including indications, contraindications, warnings, precautions, and adverse events.

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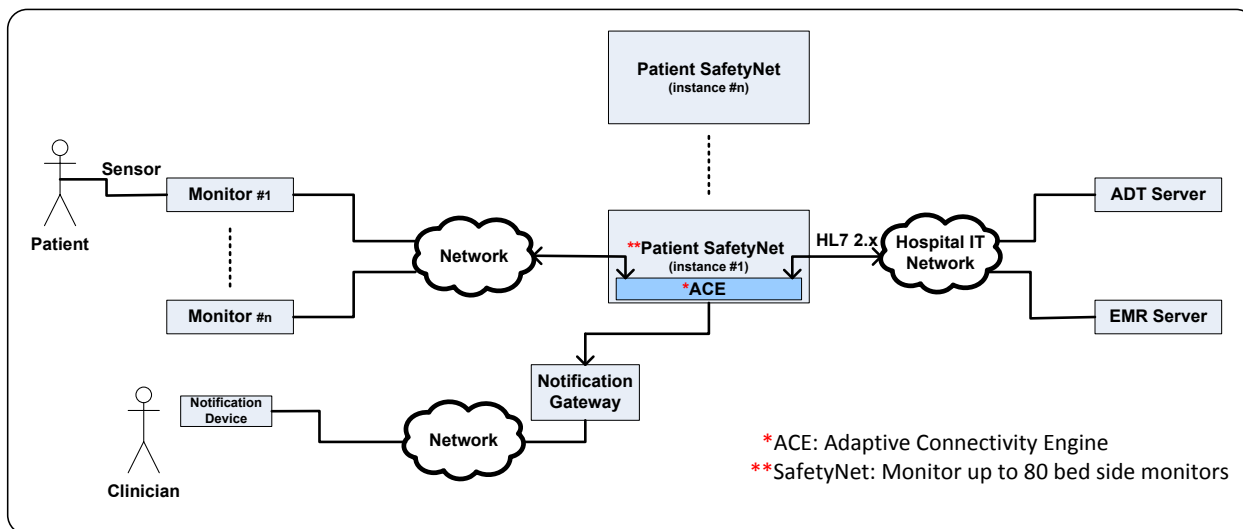
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INTRODUCTION

Masimo [Patient SafetyNet™](#)* is a supplemental remote monitoring and clinician notification system. It provides a secondary display of physiologic monitoring devices, especially Masimo SET® and rainbow® pulse oximetry and acoustic respiration rate monitors. SafetyNet enables clinicians to view and monitor patient physiological conditions when used in hospitals or hospital-type environments. The user should refer to the Operator Manual for the Patient SafetyNet System for complete instructions for use, warnings, and precautions.

The Masimo Adaptive Connectivity Engine™ (ACE) component of Patient SafetyNet interfaces to patient demographics providers, electronic medical records systems using HL7 version 2.x messages, receiving inbound Admit, Discharge, and Transfer (ADT) information, and reporting patient vital signs.



CONNECTIVITY

Patient SafetyNet is field-configured by Masimo to interface with new systems that can generate and receive HL7 version 2.x messages. Patient SafetyNet's HL7 interface can be configured to comply with the IHE Patient Care Device Technical Framework,¹ including the Pulse Oximetry Integration supplement.

SUPPORTED INTERFACE PROFILES

ADT Admit, Discharge, and Transfer (Inbound)

The Patient SafetyNet HL7 Interface supports communication of patient ADT, using HL7 messaging on a configured socket. The HL7 ADT message allows Patient SafetyNet to receive patient ADT information and make the information available to clinicians in order to admit a patient to the Patient SafetyNet system. The Patient SafetyNet admission process is an internal process to associate a connected instrument to a patient.

Deploying Patient SafetyNet HL7 ADT interface will facilitate the following:

- > Facilitate Patient Admission: Clinicians can use the patient information provided by the interface to admit patient to Patient SafetyNet system (more detail in section 7 Patient SafetyNet Admission).
- > Facilitate Vital Signs Reporting: Using patient information provided by the interface will facilitate vital signs reporting (outbound messages) to the Electronic Medical Record (EMR), Patient SafetyNet system will use patient information (e.g. Master Record Number) to report patient vital signs to the EMR.

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Supported ADT messages

The Patient SafetyNet HL7 Interface supports the following HL7 version 2.x ADT messages:

Message Code	Description
A01	Admit/Visit Notification
A02	Transfer a Patient
A03	Discharge/End Visit
A04	Register a Patient
A06	Change an Outpatient to an Inpatient
A07	Change an Inpatient to an Outpatient
A08	Update Patient Information
A11	Cancel Admit/Visit Notification
A12	Cancel Transfer
A13	Cancel Discharge/End Visit
A17	Swap Patients
A18	Merge Patient Information
A23	Delete a Patient Record
A34	Merge Patient Information – Patient ID Only
A35	Merge Patient Information – Account Number Only
A36	Merge Patient Information – Patient ID and Account Number
A40	Merge Patient – Patient Identifier List
A46	Change Patient ID
A47	Change Patient Identifier List

Other message types do not affect Patient SafetyNet’s patient roster, and are processed by sending an acknowledgement only.

Device Observation Reporting (Outbound)

The Patient SafetyNet HL7 interface supports and acts as an IHE PCD Device Observation Reporter (DOR) where the Patient SafetyNet HL7 interface periodically sends patients' vital signs to systems, which act as Device Observation Consumers (DOC) (e.g., an EMR). The IHE support message for vital signs is the PCD-01 message.

Patient SafetyNet sends parameters monitored by Masimo Instruments connected to the SafetyNet system. Below are the outbound vital signs parameters, unit of measure, and HL7 tags.

Identifier (OBX-3)	Vital Sign	Units (OBX-6)	Unit of Measure
SpO2	Oxygen Saturation (SpO2)	%^Percent^UCUM	%
BPM	Pulse Rate (PR)	{beats}/min^beats per minute^UCUM	BPM (1/min)
PI	Perfusion Index (PI)	%^Percent^UCUM	%
SpCO	Carbon Monoxide (SpCO)	%^Percent^UCUM	%
SpMet	Methaemoglobin (SpMet)	%^Percent^UCUM	%
SpHb	Noninvasive Haemoglobin (SpHb)	g/dL^g/dL^UCUM	g/dL
CAO2	Oxygen Content (SpOC)	mL/dL^mL/dL^UCUM	ml O2/dL blood
PVI	Pleth Variability Index (PVI)	%^Percent^UCUM	%
RR	Acoustic Respiration Rate (RRa)	{breaths}/min^breaths per minute^UCUM	Breaths/min
PORR	Pleth Respiration Rate (RRp)	{breaths}/min^breaths per minute^UCUM	Breaths/min
PSIF	Patient State Index (PSI)	{PSI}^PSI^UCUM	(dimensionless index)

Identifier (OBX-3)	Vital Sign	Units (OBX-6)	Unit of Measure
SUPB	Suppression Ratio	%^Percent^UCUM	%
EMGB	Electromyography	%^Percent^UCUM	%
ARTB	Artifact	%^Percent^UCUM	%
EMG_SEFL	Spectral Edge Frequency Left	Hz^Hz^UCUM	Hz
EMG_SEFR	Spectral Edge Frequency Right	Hz^Hz^UCUM	Hz
EtCO2	End-tidal CO2	%^Percent^UCUM	%
FiCO2	Fractional Concentration of Inspired CO2	%^Percent^UCUM	%
EtCO2RR	Capnography Respiratory Rate	{breaths}/min^breaths per minute^UCUM	Breaths/min

Sample Outbound Message

A full sample SafetyNet Message is found below, including outbound results:

```
MSH|^~\&|PSN|PSN|||20111021175130.7370-0700||ORU^R01|92176046-e469-4d34-9e56-711ab3adeb04|P|2.4||NE|NE
PID|||27^3^M10||LASTNAME^FIRSTNAME^MIDDLE^|^19650404|M|||^^^^^P^~~~~^VACAE^~~~~^VACAA^~~~~^VACAC^~~~~
^^^VACAM^~~~~^VACAO
PV1|||MED/SURG^201^2
OBR|1|8224e161-89a1-4fe8-aad2-a4c5578ab635^^000180ffff7f0b15^EUI-64|0609c6eb-d8ce-4180-b73d-
343c922f2776^^000180ffff7f0b15^EUI-64|44616-1^Pulse oximetry panel^LN|||20130328160302.2739-
0500|||||||||||||||||||||252465000^Pulse oximetry^SCT|255238004^Continuous^SCT
OBX|1|NM|SpO2|1.0.1.1|99|%^Percent^UCUM||||F|||20130328160302.2739-0500
OBX|2|NM|BPM|1.0.1.2|82|{beats}/min^beats per minute^UCUM||||F|||20130328160302.2739-0500
OBX|3|NM|PI|1.0.1.9|19.60|%^Percent^UCUM||||F|||20130328160302.2739-0500
OBX|4|NM|SpCO|1.0.1.5|1|%^Percent^UCUM||||F|||20130328160302.2739-0500
OBX|5|NM|SpMet|1.0.1.4|1.0|%^Percent^UCUM||||F|||20130328160302.2739-0500
OBX|6|NM|SpHb|1.0.1.3|8.9|g/dL^g/dL^UCUM||||F|||20130328160302.2739-0500
OBX|7|NM|CAO2|1.0.1.6|0.1|mL/dL^mL/dL^UCUM||||F|||20130328160302.2739-0500
OBX|8|NM|PVI|1.0.1.8|37|%^Percent^UCUM||||F|||20130328160302.2739-0500
OBX|9|NM|RR|1.0.2.1|21|{breaths}/min^breaths per minute^UCUM||||F|||20130328160302.2739-0500
OBX|10|NM|PORR|1.0.1.7|0.0|{breaths}/min^breaths per minute^UCUM||||F|||20130328160302.2739-0500
```

Note: SafetyNet supports integration with third-party patient monitors, which generate additional vital signs measurements, with their own HL7 parameter definitions. These messages are configurable and are not included in this document.

Message Acknowledgement (Outbound)

The Patient SafetyNet HL7 interface sends an acknowledgement message for each received message to the sending system.

Time Synchronisation (Inbound)

The Patient SafetyNet appliance can be configured to synchronise its clocks with other systems in the institution using Network Time Protocol (NTP).²

MESSAGE FORMATTING

Character Encodings

The SafetyNet HL7 interface currently supports the following message character encodings:

- > ASCII
- > UTF-8 Unicode
- > ISO 8859-1

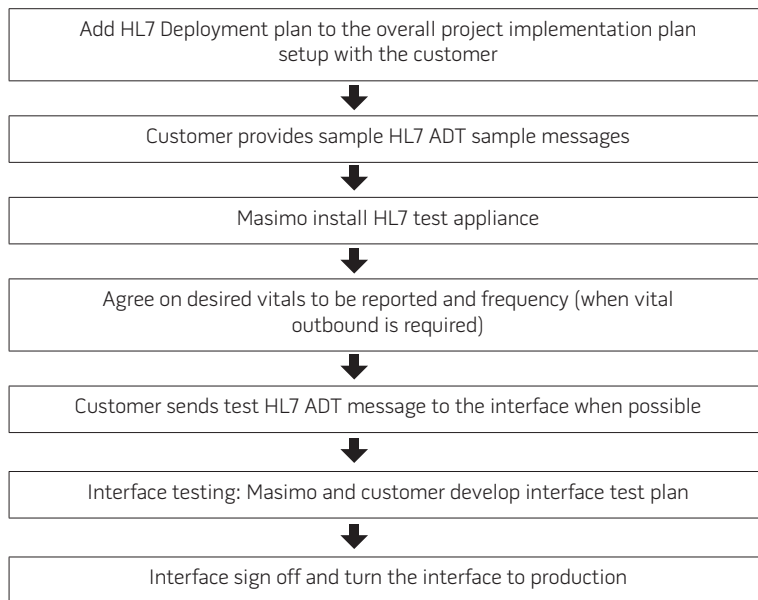
INTERFACE DEPLOYMENT

Interface Deployment Process

The standard deployment process for the Patient SafetyNet HL7 interface is as follows:

- > The Masimo Project Implementation Team sets up a formal project with the customers.
- > The customer provides sample ADT messages and identifies key data fields.
- > Masimo installs the SafetyNet Appliance and provides the customer with an HL7 interface IP address and port number.
- > When outgoing result reporting is required, the customer identifies the desired parameters and reporting frequency of the vital signs data.
- > The customer sends sample ADT message to the interface when possible.
- > Interface testing: Masimo and customer develop interface test plan.
- > Interface sign off and turn the interface to production.

Below is the interface deployment workflow:



Interface Deployment Workflow

Interface Testing

Masimo and the customer may develop an interface test plan that includes test cases for verification.

Example test cases are shown:

Registration Function	Expected Trigger	Comments
Admit a patient to Location A	A01	
Update demographic data	A08	
Transfer patient to Location B	A02	
Discharge patient	A03	
Register ED patient	A04	
Admit ED patient to Location C	A06	
Transfer patient to Location A	A02	
Register ED patient	A04	
Admit ED patient to Location B	A06	
Swap patient beds	A17	
Discharge patient	A03	
Admit a patient to Location A	A01	
Update demographic data	A08	
Cancel admit	A11	
Register ED patient	A04	
Admit ED patient to Location A	A06	
Transfer inpatient to outpatient	A07	
Admit patient to Location A	A01	
Move patient account	A35	
Transfer patient to Location B	A02	
Update patient demographic	A08	
Discharge patient	A03	

Inbound/Outbound Message Configuration

Masimo can configure SafetyNet HL7 interface for any inbound messages to smooth and facilitate the interface deployment process. Providing sample ADT messages early in the interface deployment process stages helps to identify any configuration needed in the interface before starting interface testing.

Initial Patient Index Synchronisation

Before going live with the system, Patient SafetyNet needs to synchronise its patient roster with the current set of admitted patients for the nursing units where the system is deployed. There are two approaches to accomplish this:

- > Enable the ADT message feed with enough time (e.g., two weeks) prior to the Patient SafetyNet system going live, or
- > Populate a comma delimited file with the currently admitted patients. Masimo uploads the patient information to the SafetyNet HL7 patient roster before the customer enables the HL7 ADT message feed when the SafetyNet system goes live. Below is a sample suggested format for the file:

Unit	Description	Unit^Room^Bed	MRN	Account	Name	DOB	Age	Sex	Admit Dt
A	SURGERY ICU A	A^112^A	XXX-XXX-XX	999999	First Name, Last Name	3/2/1987	26	M	3/23/2012
B	SURGERY ICU B	B^114^B	XXX-XXX-XX	999999	First Name, Last Name	4/6/1954	59	M	5/15/2012
C	SURGERY ICU C	C^118^C	XXX-XXX-XX	999999	First Name, Last Name	2/9/1990	23	M	9/9/2012

DATA PRIVACY AND PHI

Patient SafetyNet has been designed in compliance with the requirements of the HIPPA regulations. Patient SafetyNet stores a minimal set of patient Protected Health Information (PHI) and maintains it in an access controlled environment made available for clinicians to use during the admission process in SafetyNet (see Patient SafetyNet Admission – section 7). The SafetyNet HL7 interface uses the patient information to identify vital signs to patients in outbound messages. SafetyNet does not use any of the PHI data except for sending patient vital sign outbound messages.

The patient information fields are as follows:

Field Name	Required
Given Name (PID-5-2)	Required
Family Name (PID-5-1)	Required
Middle Name (PID-5-3)	Optional
Patient ID (MRN) (PID-2 and/or PID-3)	Required
Patient Account Number (PID-18)	Required
Room Number/Point of Care/Bed (PV1-3)	Required
Admit Status	Required
SSN (PID-19)	Optional
Religion (PID-17)	Optional
Marital Status (PID-16)	Optional
Sex (PID-8)	Optional
Date of Birth (PID-7)	Optional
Patient Class (PV1-2)	Optional

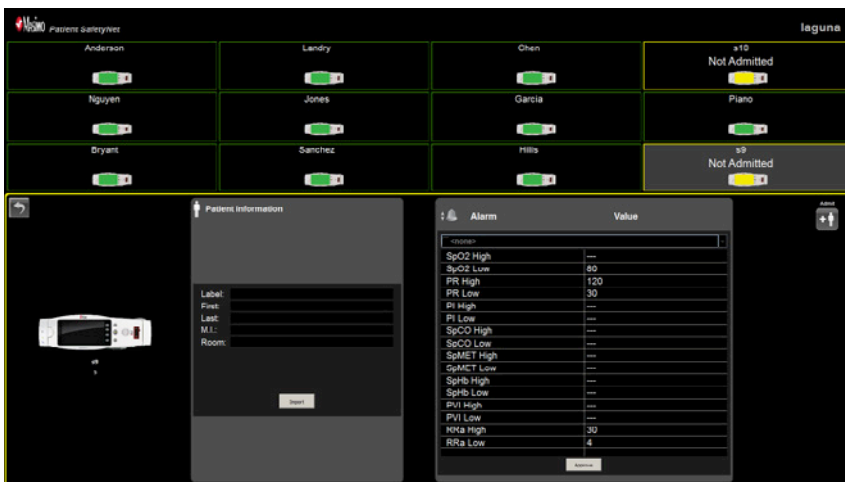
PATIENT SAFETYNET ADMISSION

To provide more insight into the SafetyNet admission process and how Patient ADT information will be used, a step-by-step outline of the SafetyNet admission process is shown below.

The admission starts with the user selecting a device from the SafetyNet user interface:



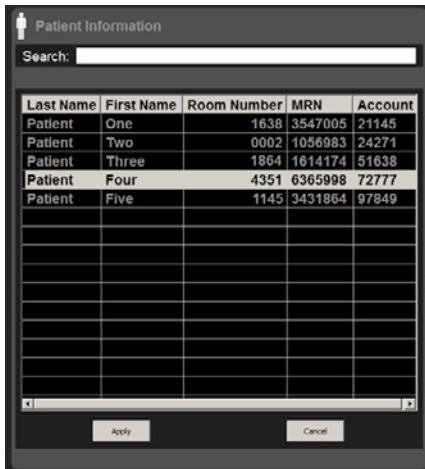
Next, the user presses the Patient Admit Button to access the admission interface as shown below:



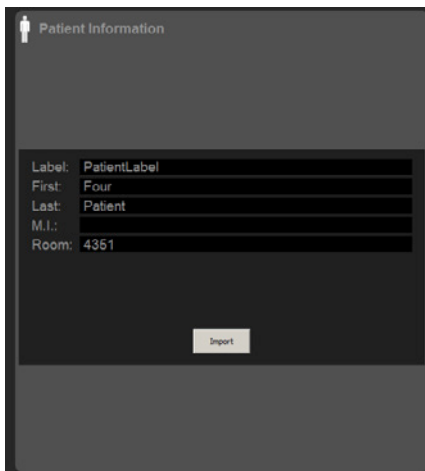
The user can access the list of patients in the appropriate units as received from the HL7 ADT message feed by pressing the Import button.



The user selects a patient and presses Apply.



Patient information is automatically populated.



INTERFACE MANAGEMENT AND TECHNICAL SUPPORT

- > Masimo provides 24/7 technical support for all products via phone number 800-326-4890. Customers need to choose option #2 for technical support. Contact information can be found on Masimo's website, <http://www.masimo.com/contact.htm>.
- > Masimo has three levels of technical support within the company and 99% of issues are directly resolved within level 1 and level 2 technical support. Other problems can be escalated to level 3 technical support within Masimo's Engineering group.
- > Masimo's Service Level Agreement for technical support specifies a response within 30 minutes during normal working hours. Normal working hours are from 6:00am to 5:00pm PST, Monday through Friday. After hours, Masimo will provide a technical support response within two hours.

REFERENCES

¹ http://ihe.net/Technical_Framework/index.cfm#pcd

² This functionality is intended to conform to the Consistent Time (CT) profile of the IHE IT Infrastructure Technical Framework; see http://ihe.net/Technical_Framework/upload/IHE_ITI_TF_Vol2a-2.pdf for details.

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