Dialysis Machine HL7 Implementation Guidelines

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Revision History

Version	Change Description	Date
1.0	Initial Release	January 2020
2.0	Added appendix summarizing HL7 Batch Protocol for capturing an entire treatment Added support for multiple filters during a treatment Added description of IEEE private terms for supporting manufacturer specific data. Added support for open-ended treatments that have to specific terminating conditions. Clarified the support for two types of reported alarms/alerts. The guide now supports the IEEE events and the original proposed Boolean values.	October 2020
3.0	Changed "MDCX" to "MDC". Added IEEE Reference IDs	January 2021

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1 Introduction & Scope

1.1 Purpose

The Dialysis Machine Implementation Guide is a messaging specification intended to standardize the electronic reporting of patient, clinical, and machine data to electronic health record (EHR) systems and/or electronic medical record (EMR) systems found in most care settings today. The goal of this specification is to provide an applicable set of data definitions and structures that can be adopted as a worldwide industry standard, thereby obviating the need for proprietary solutions for dialysis healthcare interoperability.

1.2 Audience

The standards defined in this guide are intended for use by data exchange systems found in Renal Care groups listed below:

- Renal Care Providers
- Dialysis System Manufacturers
- Other groups or agencies that employ a dialysis machine to EHR/EMR interface

1.3 Scope

This specification focuses exclusively on the electronic reporting of device treatment data from a dialysis machine to an EHR/EMR for hemodialysis therapies based on HL7 v2.6 messaging. Specifically, the patient info, treatment system readings, thresholds, and alarms which may be generated during machine usage can be communicated.

This specification does NOT cover peritoneal dialysis or communication from an EHR/EMR to the dialysis machine.

1.4 Assumptions

This document assumes that users have a need to exchange treatment data between dialysis devices and EHRs. It also assumes that the user is familiar with the HL7 v2.6 standard as well as the IHE PCD specifications.

1.5 Conventions

This specification is primarily based on the Integrating the Healthcare Enterprise (IHE), Patient Care Device (PCD) technical framework, which is based on a profile as defined in the Health Level 7 (HL7)'s v2.6 Normative Standard. A message profile is an unambiguous specification of an HL7 message type intended for a particular use case, as defined in Section 2.B of the HL7 v2.6 Standard. Additionally, the message structures and terminology are based on the ISO/IEEE 11073 Standard for Medical Device Communication.

An HL7 message profile defines both the *dynamic* aspects of information interchange (i.e., the systems that participate in such interchanges and the real-world events that trigger messaging) as well as the *static* aspects of messaging (i.e., the structure and contents of the electronic messages that are exchanged).

Optionality (aka. Usage) is defined as one of the values in the following table.

Usage Values

Value	Description
B	Left for backwards compatibility.
C	Conditional
CE	Conditional but maybe empty.
O	Optional
R	Required
RE	Required but maybe Empty. The field or data type component description must stipulate when the field or data type component may be empty.

Usage Values

Value	Description
W	Withdrawn
X	Not used

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

The values reported in the observations should be the value as shown to the user on the device. The purpose of this is to create a run sheet that could be referenced back to events as seen by the users. As such, sampling rates, average methods, or other mathematical manipulations of signals is beyond the scope of this standard. Likewise, logic for initiating or terminating events is not defined in this standard. Since these items may vary between manufacturers or machines, if this information is relevant to understanding the reported data, it should be disclosed in the manufacturer's technical documentation.

1.6 Referenced Standards

Ref	Title
[1]	IHE Patient Care Device, Technical Framework Volume 1 - Profiles, Rev 9.0 – Final Text, December 12, 2019
[2]	IHE Patient Care Device, Technical Framework Volume 2 - Transactions, Rev 9.0 – Final Text, December 12, 2019
[3]	IHE Patient Care Device, Technical Framework, Volume 3 – Sematic Content, Rev 9.0 – Final Text, December 12, 2019
[4]	IHE IT Infrastructure (ITI) Technical Framework Volume 1 - Integration Profiles, Rev 14.0, July 21, 2017
[5]	HL7 v2.6 Normative Standard, October 2007
[6]	ISO/IEEE 11073-10101R Health informatics – Point-of-care, Medical Device Communication – Part 10101: Nomenclature, 2015-09
[7]	ISO/IEEE 11073-10201 Health informatics – Point-of-care, Medical Device Communication – Part 10201: Domain information model, First Edition, 2004-12-15
[8]	ISO/IEEE 11073-10101R Health informatics – Point-of-care, Medical Device Communication – Part 10101b: Nomenclature
[9]	ISO/IEEE 11073-10301 Health informatics – Point-of-care, Medical Device Communication – Part 10201: Domain information model, First Edition, 2004-12-15
[10]	ISO/IEEE 11073-20101 Health informatics – Point-of-care, Medical Device Communication – Part 20101: Application Profiles – Base Standard, First Edition, 2004-12-15

1.7 Glossary

DOC: Device Observation Consumer

DOR: Device Observation Report
IHE: Integrating the Healthcare Enterprise – An initiative by healthcare professionals and industry to improve the way computer systems in healthcare share information.
MDS: Medical Device System
MDC: Medical Device Communications
MLLP: Minimal Lower Layer Protocol – is used for transferring HL7 messages over Ethernet. It defines delimiters which identify the beginning and ends of the HL7 message.
PCD: Patient Care Device – An IHE domain formed to address the integration of medical devices into the healthcare enterprise.
VMD: Virtual Medical Device
UOM: Unit of Measure
CARD: Cardinality

2 Patient Identification

Patient Identification is perhaps the most essential infrastructural component of any interoperability and communication process, particularly when PCD data is exported to the enterprise. It is the key element in medical device, communication, data analysis, reporting and record keeping. Automation of the entry of patient identification to patient care device has the potential for improving throughput, reducing errors, increasing safety and device and drug effectiveness, and efficiency. It is strongly recommended that implementations use IHE Patient Demographics Query (PDQ) Integration Profile compliant transactions for acquisition of Patient Identification credentials. These transactions include: ITI-21, ITI-30 and ITI-31. Other mechanisms such as bar code or RFID are also valid alternatives or complements.

If the Dialysis Machine has no way of obtaining a Patient Identifier, it will report a string value that is Model/Serial_Number.

3 Time Synchronization

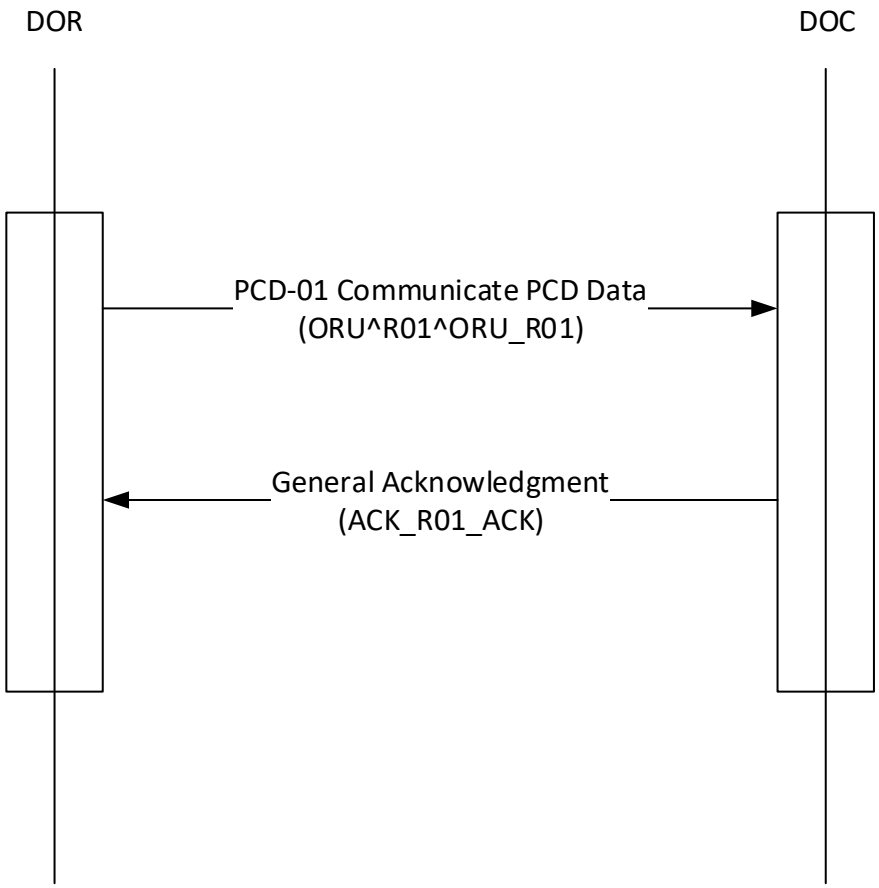
The data reported by a dialysis machine must be reconcilable with data from other parts of the health care enterprise. In order for this to occur, time must be synchronized between the machines involved in the transactions. To this end, dialysis machines compliant with this standard will use the IHE Consistent Time (CT) Protocol. The Consistent Time Profile specifies the use of the Network Time Protocol (NTP) defined in RFC1305.

4 Reporting Treatment Information

4.1 Overview

The sending of Treatment Information to the EMR System is accomplished using the Patient Care Device (PCD) domain in the Device Enterprise Communication (DEC) IHE profile. In doing so, the Dialysis Machine acts as the Device Observation Report (DOR) and the EMR is the Device Observation Consumer (DOC).

Figure 1 - Communicate PCD Data Interaction Diagram



In general, the Dialysis Machine sends periodic reports at an interval of between several times per minute (high acuity) and a maximum interval of 24 hours (chronic, home health). The minimum and maximum intervals are configured at implementation. The Dialysis Machine may also send aperiodic reports for "event type" information.

This specification includes different observation types based on differing real-world triggers. The elements for each observation are indicated in Section 7 - Dialysis Data Elements. The types are:

- Status – Sent initially, terminally, and when the treatment status changes
- Parameter – Sent initially and when any parameter changes
- Identifier – Sent with all messages
- Blood Pressure – Sent when communicating a measurement

A Status Report will contain all mandatory elements, the applicable conditional elements, and the optional elements supported by the dialysis machine. In addition, the dialysis machine may report other data objects not identified by this standard. This allows the device manufacturer to report information that is not common across all dialysis machines and is therefore not part of this standard.

The nature of the PCD-01 message is that it contains a snapshot in time of the treatment. The capturing of an entire treatment into a "run sheet" can be accomplished using the HL7 Batch Protocol described in Appendix A.

4.2 Device Request

4.2.1 Message Structure

Segments shown in gray are not used in this standard.

Segment	Meaning	Use	Card
MSH	Message Header	R	[1..1]
[{SFT}]	Software Segment	X	[0..0]
[UAC]	User Authentication Credential	X	[0..0]
{	--- PATIENT_RESULT begin		
[	--- PATIENT begin		
PID	Patient Identification	R	[1..1]
[PD1]	Additional Demographics	X	[0..0]
[{PRT}]	Participation	X	[0..0]
[{NTE}]	Notes and Comments	X	[0..0]
[{NK1}]	Next of Kin/Associated Parties	O	[0..3]
[	--- VISIT begin		
PV1	Patient Visit	R	[1..1]
[PV2]	Patient Visit – Additional Info	X	[0..0]
[{PRT}]	Participation	X	[0..0]
]	--- VISIT end		
]	--- PATIENT end		
{	---ORDER_OBSERVATION begin		
[ORC]	Order Common	X	[0..0]
OBR	Observation Request	R	[1..1]
[{NTE}]	Notes and Comments	O	[0..1]
[{PRT}]	Participation	X	[0..0]
[{	--- TIMING_QTY begin		
TQ1	Timing/Quantity	X	[0..0]
[{TQ2}]	Timing/Quantity Order Sequence	X	[0..0]
}]	--- TIMING_QTY end		
[CTD]	Contact Data	X	[0..0]
[{	--- OBSERVATION begin		
OBX	Observation Result	R	[1..N]
[{PRT}]	Participation	X	[0..0]
[{NTE}]	Notes and comments	X	[0..0]
}]	--- OBSERVATION end		
[{FT1}]	Financial Transaction	X	[0..0]
[{CTI}]	Clinical Trial Identification	X	[0..0]
[{	--- SPECIMEN begin		
SPM	Specimen	X	[0..0]
[{OBX}]	Observation related to Specimen	X	[0..0]
}]	--- SPECIMEN end		
}	--- ORDER_OBSERVATION end		
}	--- PATIENT_RESULT end		
[DSC]	Continuation Pointer	X	[0..0]

4.2.2 Observation Results Structure

Observation results are grouped in the hierarchy of Medical Device System (MDS), Virtual Medical Device (VMD), Channel, and Metric/Observation. When VMD is not present in the dialysis machine, the VMD information is not reported. For example, when a dialysis machine does not have a blood pressure cuff, the

MDC_DEV_PRESS_BLD_NONINV_VMD is not reported. If a Channel does not contain any Metrics/Observations due to dialysis machine therapy or operating mode, the channel is not reported. For example, when a dialysis machine is performing a Hemofiltration Therapy, the MDC_DEV_HDIALY_FLUID_CHAN will not be reported. Because of this dynamic nature, sub-observation IDs will change from treatment to treatment and should not be used for parsing of messages from the dialysis machine. If the Mode of Operation (MDC_HDIALY_MACH_MORE_OF_OPERATION) is Service or Idle then only the Machine Channel (MDC_DEV_HDIALY_MACH_CONFIG_CHAN) is present.

4.2.3 Event Status

This standard allows event information to be transmitted in one of two methods.

- True/False
- Start/Continue/End

When True/False is used, the dialysis machine communicates the state of each event in every PCD-01 message. The event is either active (i.e. True) or Inactive (i.e. False). Since the dialysis machine is sending PCD-01 messages every time status changes instead of just periodically, the time associated with an event state transition is the time of the observation as specified by time point OBX-14 or the default time point specified by OBR-7.

Example, Blood Leak not detected

```
OBX|20|ST|198244^MDC_EVT_HDIALY_BLOOD_LEAK^MDC|1.1.4.15|F||||||F
```

Example, Blood Leak detected

```
OBX|20|ST|198244^MDC_EVT_HDIALY_BLOOD_LEAK^MDC|1.1.4.15|T||||||F
```

When Start/Continue/End is used the dialysis machine communicates the starting and ending time of the event. The time associated with these events is expressly indicated in the OBX-14 portion of the event. In PCD-01 messages where the event did not start or end but is still active the dialysis machine reports continue. In the case where a dialysis machine does not know the starting time of an event, it will transmit continue as the first state for the event.

Example, Blood Leak detected

```
OBX|20|ST|198244^MDC_EVT_HDIALY_BLOOD_LEAK^MDC|1.1.4.15|start|||||||||20191003092005+0000
```

Example, Blood Leak ongoing

```
OBX|20|ST|198244^MDC_EVT_HDIALY_BLOOD_LEAK^MDC|1.1.4.15|continue|||||||||20191003092015+0000
```

Example, Blood Leak done

```
OBX|20|ST|198244^MDC_EVT_HDIALY_BLOOD_LEAK^MDC|1.1.4.15|end|||||||||20191003092032+0000
```

The following figure shows how the dialysis machine would report an event for each of the two methods.

Figure 2 – Event Status in PCD-01 Messages

Using Start/Continue/End

* PCD01 Msg at Time 9:20:00 would not mention the event.
* PCD01 Msg at Time 9:20:05 would contain the Start with a Time of 9:20:05.
* PCD01 Msg at Time 9:20:15 and 9:20:25 would contain the Continue.
* PCD01 Msg at Time 9:20:32 would contain the End with a timestamp of 9:20:32.
* PCD01 msg at Time 9:20:42 and beyond would not mention the event

Using True/False without Timestamp in OBX

* PCD01 Msg at Time 9:20:00 would have an event value of False.
* PCD01 Msg at Time 9:20:05, 9:20:15, & 9:20:25 would have an event value of True.
* PCD01 Msg at Time 9:20:32 and beyond would have an event value of false.

4.2.4 Example 1 – Minimal Message when Idle

This message is a periodic report of the dialysis machine status. It is reported when the machine is Idle or in Service.

```
MSH|^~\&|ACME_Dialysis_Machine^080019FFFE3ED02D^EUI-
    64||||20191003092006+0000||ORU^R01^ORU_R01|20191003092005|P|2.6|||AL|NE|||||IHE_PCD_001^IHEPC
    D^1.3.6.1.4.12559.11.1.1.129^ISO

PID|||Scrubber 2000/SC678932^^^"^U||^^^^^^U

OBR|1||080019FFFE3ED02D20110602045842^ACME_Dialysis_Machine^080019FFFE3ED02D^EUI-
    64|70929^MDC_DEV_HDIALY_MACHINE_MDS^MDC|||20191003092005+0000

OBX|1|ST|70929^MDC_DEV_HDIALY_MACHINE_MDS|1.0.0|||||||F

OBX|2|ST|67880^MDC_ATTR_ID_MODEL^MDC|1.0.0.1|NxStage System One||||||F

OBX|3|ST|531970^MDC_ID_MODEL_MANUFACTURER^MDC|1.0.0.2|NxStage||||||F

OBX|4|ST|531969^MDC_ID_MODEL_NUMBER^MDC|1.0.0.3|System One||||||F

OBX|5|ST|531972^MDC_ID_PROD_SPEC_SERIAL^MDC|1.0.0.4|1000478||||||F

OBX|6|ST|531975^MDC_ID_PROD_SPEC_SW^MDC|1.0.0.5|1.2.3.4||||||F

OBX|7|ST|70934^MDC_DEV_HDIALY_VMD|1.1|||||||F

OBX|8|ST|70939^MDC_DEV_HDIALY_MACHINE_CONFIG_CHAN|1.1.1|||||||F

OBX|9|DTM|158592^MDC_HDIALY_MACH_TIME^MDC|1.1.1.1|20191003092005+0000||||||F

OBX|10|ST|158594^MDC_HDIALY_MACH_MODE_OF_OPERATION^MDC|1.1.1.3|IDL||||||F
```

4.2.5 Example 2 – Minimal Message when Treating

This message is a periodic report of a dialysis treatment status. It contains the minimum number of reported items.

Note, this standard reports Boolean event values in the PCD-01 transaction. This is done so that a complete record of the machine state is captured in the PCD-01. The state of the events is not considered clinically actionable. Clinically actionable alerts and events are communicated in the PCD-04 transaction.

```
MSH|^~\&|ACME_Dialysis_Machine^080019FFFE3ED02D^EUI-64||||20191003092006+0000||ORU^R01^ORU_R01|20191003092005|P|2.6|||AL|NE|||||IHE_PCD_001^IHEPCD^1.3.6.1.4.12559.11.1.1.129^ISO

PID|||Scrubber 2000/SC678932^^^"^U||^^^^^^U

OBR|1||080019FFFE3ED02D20110602045842^ACME_Dialysis_Machine^080019FFFE3ED02D^EUI-64|70929^MDC_DEV_HDIALY_MACHINE_MDS^MDC|||20191003092005+0000

OBX|1|ST|70929^MDC_DEV_HDIALY_MACHINE_MDS|1.0.0|||||||F

OBX|2|ST|67880^MDC_ATTR_ID_MODEL^MDC|1.0.0.1|NxStage System One||||||F

OBX|3|ST|531970^MDC_ID_MODEL_MANUFACTURER^MDC|1.0.0.2|NxStage||||||F

OBX|4|ST|531969^MDC_ID_MODEL_NUMBER^MDC|1.0.0.3|System One||||||F

OBX|5|ST|531972^MDC_ID_PROD_SPEC_SERIAL^MDC|1.0.0.4|1000478||||||F

OBX|6|ST|531975^MDC_ID_PROD_SPEC_SW^MDC|1.0.0.5|1.2.3.4||||||F

OBX|7|ST|70934^MDC_DEV_HDIALY_VMD|1.1|||||||F

OBX|8|ST|70939^MDC_DEV_HDIALY_MACHINE_CONFIG_CHAN|1.1.1|||||||F

OBX|9|DTM|158592^MDC_HDIALY_MACH_TIME^MDC|1.1.1.1|20191003092005+0000||||||F

OBX|10|ST|158594^MDC_HDIALY_MACH_MODE_OF_OPERATION^MDC|1.1.1.3|TX||||||F

OBX|11|ST|158596^MDC_HDIALY_MACH_BLD_PUMP_ON^MDC|1.1.1.7|T||||||F

OBX|12|ST|158597^MDC_HDIALY_MACH_TX_FLUID_BYPASS^MDC|1.1.1.8|F||||||F

OBX|13|ST|158598^MDC_HDIALY_MACH_TX_MODALITY^MDC|1.1.1.9|HDF||||||F

OBX|14|NM|158720^MDC_HDIALY_MACH_THERAPY_TIME^MDC|1.1.1.10|180|min^minutes^UCUM|||||F

OBX|15|NM|158724^MDC_HDIALY_MACH_TIME_REMAIN^MDC|1.1.1.11|600|min^minutes^UCUM|||||F

OBX|16|ST|70947^MDC_DEV_HDIALY_BLOOD_PUMP_CHAN|1.1.3|||||||F

OBX|17|NM|16935956^MDC_HDIALY_BLD_PUMP_BLOOD_FLOW_RATE_SETTING^MDC|1.1.3.2|250|ml/min^milliliter per minute^UCUM|||||F

OBX|18|NM|158744^MDC_HDIALY_BLD_PRESS_ART^MDC|1.1.3.4|-75|mm[Hg]^Millimeters of Mercury^UCUM|< -200||||F

OBX|19|ST|158604^MDC_HDIALY_BLD_PUMP_MODE^MDC|1.1.3.5|2N||||||F

OBX|20|ST|198242^MDC_EVT_HDIALY_BLD_PUMP_STOP^MDC|1.1.3.6|F||||||F

OBX|21|NM|158776^MDC_HDIALY_BLD_PUMP_PRESS_VEN^MDC|1.1.3.15|200|mm[Hg]^Millimeters of Mercury^UCUM|20-400||||F

OBX|22|ST|70951^MDC_DEV_HDIALY_FLUID_CHAN|1.1.4|||||||F

OBX|23|NM|158788^MDC_HDIALY_DIALYSATE_COND^MDC|1.1.4.3|13.81|mS/cm^millsiemens per centimeter^UCUM|||||F

OBX|24|ST|198244^MDC_EVT_HDIALY_BLOOD_LEAK^MDC|1.1.4.15|F||||||F

OBX|25|ST|70955^MDC_DEV_HDIALY_FILTER_CHAN|1.1.5|||||||F

OBX|26|NM|158852^MDC_HDIALY_FILTER_TRANSMEMBRANE_PRESS^MDC|1.1.5.2|35|mm[Hg]^Millimeters of Mercury^UCUM|||||F

OBX|27|ST|70963^MDC_DEV_HDIALY_SAFETY_SYSTEMS_CHAN|1.1.7|||||||F

OBX|28|ST|198252^MDC_EVT_HDIALY_SAFETY_ART_AIR_DETECT^MDC|1.1.7.1|F||||||F

OBX|29|ST|198258^MDC_EVT_HDIALY_SAFETY_SYSTEM_GENERAL^MDC|1.1.7.4|F||||||F

OBX|30|ST|198216^MDC_EVT_SELFTEST_FAILURE^MDC|1.1.7.5|F||||||F

OBX|31|ST|198262^MDC_EVT_HDIALY_SAFETY_VEN_AIR_DETECT^MDC|1.1.7.7|F||||||F

OBX|32|ST|70967^MDC_DEV_HDIALY_THERAPY_OUTCOMES_CHAN|1.1.8|||||||F

OBX|33|ST|158618^MDC_HDIALY_THERAPY_COMPLETE_METHOD^MDC|1.1.8.18|UF||||||F

OBX|34|ST|70971^MDC_DEV_HDIALY_UF_CHAN|1.1.9|||||||F

OBX|35|NM|159028^MDC_HDIALY_UF_TARGET_VOL_TO_REMOVE^MDC|1.1.9.4|2000|ml^milliliter^UCUM|||||F

OBX|36|NM|159032^MDC_HDIALY_UF_ACTUAL_REMOVED_VOL^MDC|1.1.9.5|555|ml^milliliter^UCUM|||||F

OBX|37|ST|158619^MDC_HDIALY_UF_MODE^MDC|1.1.9.7|CONST-WT||||||F

OBX|38|NM|159036^MDC_HDIALY_UF_RATE^MDC|1.1.9.8|100|ml/h^milliliter per hour^UCUM|||||F
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OBX|39|ST|198276^MDC_EVT_HDIALY_UF_RATE_RANGE^MDC|1.1.9.10|F||||||F
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4.2.6 Example 3 – Full Message

This message reports all mandatory and optional fields for a pre/post dilution HDF therapy.

```
MSH|^~\&|ACME_Dialysis_Machine^080019FFFE3ED02D^EUI-
    64||||20191003092025+0000||ORU^R01^ORU_R01|20191003092024|P|2.6|||AL|NE|||||IHE_PCD_001^IHEPC
    D^1.3.6.1.4.12559.11.1.1.129^ISO

PID|||Scrubber 2000/SC678932^^^"^U||^^^^^^U

OBR|1||080019FFFE3ED02D20110602045842^ACME_Dialysis_Machine^080019FFFE3ED02D^EUI-
    64|70929^MDC_DEV_HDIALY_MACHINE_MDS^MDC|||20191003092024+0000

OBX|1|ST|67880^MDC_ATTR_ID_MODEL^MDC|1.0.0.1|NxStage System One||||||F

OBX|2|ST|531970^MDC_ID_MODEL_MANUFACTURER^MDC|1.0.0.2|NxStage||||||F

OBX|3|ST|531969^MDC_ID_MODEL_NUMBER^MDC|1.0.0.3|System One||||||F

OBX|4|ST|531972^MDC_ID_PROD_SPEC_SERIAL^MDC|1.0.0.4|1000478||||||F

OBX|5|ST|531975^MDC_ID_PROD_SPEC_SW^MDC|1.1.1.5|1.0.0.5||||||F

OBX|6|ST|67916^MDC_ATTR_ID_UDI^MDC|1.0.0.6|+M535NX10003A0/$$+735241/16D20180305J||||||F

OBX|7|DTM|158592^MDC_HDIALY_MACH_TIME^MDC|1.1.1.1|20191003092024+0000||||||F

OBX|8|ST|158593^MDC_HDIALY_MACH_MODE_DESCRIPTION^MDC|1.1.1.2|NxStage System One||||||F

OBX|9|ST|158594^MDC_HDIALY_MACH_MODE_OF_OPERATION^MDC|1.1.1.3|TX||||||F

OBX|10|NM|184195^MDC_TIME_PD_MAINTENANCE_TO_NEXT_SERVICE^MDC|1.1.1.4|12|h^hours^UCUM|||||F

OBX|11|DTM|184199^MDC_MAINTENANCE_NEXT_SERVICE_DATE^MDC|1.1.1.5|20191003||||||F

OBX|12|NM|158595^MDC_HDIALY_MACH_MAINT_TX_REMAIN^MDC|1.1.1.6|45||||||F

OBX|13|ST|158596^MDC_HDIALY_MACH_BLD_PUMP_ON^MDC|1.1.1.7|T||||||F

OBX|14|ST|158597^MDC_HDIALY_MACH_TX_FLUID_BYPASS^MDC|1.1.1.8|F||||||F

OBX|15|ST|158598^MDC_HDIALY_MACH_TX_MODALITY^MDC|1.1.1.9|HDF||||||F

OBX|16|NM|158720^MDC_HDIALY_MACH_THERAPY_TIME^MDC|1.1.1.10|180|min^minutes^UCUM|||||F

OBX|17|NM|158724^MDC_HDIALY_MACH_TIME_REMAIN^MDC|1.1.1.11|600|min^minutes^UCUM|||||F

OBX|18|NM|188508^MDC_TEMP_ROOM^MDC|1.1.1.12|20|Cel^degree Celsius ^UCUM|||||F

OBX|19|ST|198236^MDC_EVT_HDIALY_ANTICOAG_STOP^MDC|1.1.2.4|F||||||F

OBX|20|ST|158599^MDC_HDIALY_ANTICOAG_NAME^MDC|1.1.2.5|heparin||||||F

OBX|21|ST|158600^MDC_HDIALY_ANTICOAG_MODE^MDC|1.1.2.6|CON||||||F

OBX|22|NM|68142^MDC_ATTR_CHAN_NUM_LOGICAL^MDC|1.1.2.7|1||||||F

OBX|23|ST|198238^MDC_EVT_HDIALY_ANTICOAG_SYRINGE_EMPTY^MDC|1.1.2.8|F||||||F

OBX|24|ST|158602^MDC_HDIALY_ANTICOAG_SYRINGE_BRAND^MDC|1.1.2.9|Fishman||||||F

OBX|25|NM|158603^MDC_HDIALY_ANTICOAG_SYRINGE_VOL^MDC|1.1.2.10|60|ml^milliliter^UCUM|||||F

OBX|26|ST|198240^MDC_EVT_HDIALY_ANTICOAG_SYRINGE_SIZE^MDC|1.1.2.11|F||||||F

OBX|27|NM|158740^MDC_HDIALY_BLD_PUMP_BLOOD_FLOW_RATE^MDC|1.1.3.1|250|ml/min^milliliter per
    minute^UCUM|||||F

OBX|28|NM|16935956^MDC_HDIALY_BLD_PUMP_BLOOD_FLOW_RATE_SETTING^MDC|1.1.3.2|250|ml/min^milliliter
    per minute^UCUM|||||F

OBX|29|NM|158743^MDC_HDIALY_BLD_PUMP_BLOOD_FLOW_RATE_MEAN^MDC|1.1.3.3|250|ml/min^milliliter per
    minute^UCUM|||||F

OBX|30|NM|158744^MDC_HDIALY_BLD_PRESS_ART^MDC|1.1.3.4|-75|mm[Hg]^Millimeters of Mercury^UCUM|< -
    200||||F

OBX|31|ST|158604^MDC_HDIALY_BLD_PUMP_MODE^MDC|1.1.3.5|2N||||||F

OBX|32|ST|198242^MDC_EVT_HDIALY_BLD_PUMP_STOP^MDC|1.1.3.6|F||||||F

OBX|33|ST|158605^MDC_HDIALY_BLD_PUMP_TUBING_SIZE^MDC|1.1.3.7|8 mm||||||F

OBX|34|NM|158748^MDC_HDIALY_BLOOD_TEMP_ART^MDC|1.1.3.8|39.1|Cel^degree Celsius^UCUM|||||F
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OBX|35|NM|158752^MDC_HDIALY_BLD_PUMP_CHANGE_IN_ENERGY^MDC|1.1.3.9|1|kJ/h^Kilojoule per hour^UCUM|||||F

OBX|36|NM|158756^MDC_HDIALY_BLD_PUMP_PRESS_ART_POST_PUMP^MDC|1.1.3.10|100|mm[Hg]^Millimeters of Mercury^UCUM|||||F

OBX|37|NM|158760^MDC_HDIALY_BLD_PUMP_PRIMING_VOL^MDC|1.1.3.11|191|ml^milliliter^UCUM|||||F

OBX|38|NM|158764^MDC_HDIALY_BLD_PUMP_SINGLE_NEEDLE_PRESS^MDC|1.1.3.12|200|mm[Hg]^Millimeters of Mercury^UCUM|||||F

OBX|39|NM|158772^MDC_HDIALY_BLD_PUMP_BLOOD_PROCESSED_TOTAL^MDC|1.1.3.14|120|L^liter^UCUM|||||F

OBX|40|NM|158776^MDC_HDIALY_BLD_PUMP_PRESS_VEN^MDC|1.1.3.15|200|mm[Hg]^Millimeters of Mercury^UCUM|20-400||||F

OBX|41|NM|158780^MDC_HDIALY_BLOOD_TEMP_VEN^MDC|1.1.3.16|39.1|Cel^degree Celsius^UCUM|||||F

OBX|42|NM|16935996^MDC_HDIALY_BLOOD_TEMP_VEN_SETTING^MDC|1.1.3.17|39.0|Cel^degree Celsius^UCUM|||||F

OBX|43|NM|158784^MDC_HDIALY_BICARB_COND^MDC|1.1.4.1|13.81|mS/cm^millsiemens per centimeter^UCUM|||||F

OBX|44|NM|16936000^MDC_HDIALY_BICARB_COND_SETTING^MDC|1.1.4.2|13.81|mS/cm^millsiemens per centimeter^UCUM|||||F

OBX|45|NM|158788^MDC_HDIALY_DIALYSATE_COND^MDC|1.1.4.3|13.81|mS/cm^millsiemens per centimeter^UCUM|||||F

OBX|46|NM|16936004^MDC_HDIALY_DIALYSATE_COND_SETTING^MDC|1.1.4.4|13.81|mS/cm^millsiemens per centimeter^UCUM|||||F

OBX|47|NM|158792^MDC_HDIALY_DIALYSATE_FLOW_RATE^MDC|1.1.4.5|99|ml/min^milliliter per minute^UCUM|||||F

OBX|48|NM|16936008^MDC_HDIALY_DIALYSATE_FLOW_RATE_SETTING^MDC|1.1.4.6|100|ml/min^milliliter per minute^UCUM|||||F

OBX|49|ST|158606^MDC_HDIALY_DIALYSATE_FLOW_MODE^MDC|1.1.4.7|CONST||||||F

OBX|50|NM|158800^MDC_HDIALY_DIALYSATE_AMMONIA^MDC|1.1.4.10|0.00|[ppm]^parts per million^UCUM|||||F

OBX|51|NM|158795^MDC_HDIALY_DIALYSATE_FLOW_RATE_MEAN^MDC|1.1.4.11|100|ml/min^milliliter per minute^UCUM|||||F

OBX|52|NM|16936020^MDC_HDIALY_CONC_HCO3_SETTING^MDC|1.1.4.13|32.0|mmol/L^MilliMolesPerLiter^UCUM|||||F

OBX|53|ST|158607^MDC_HDIALY_CONC_HCO3_MODE^MDC|1.1.4.14|PRO||||||F

OBX|54|ST|198244^MDC_EVT_HDIALY_BLOOD_LEAK^MDC|1.1.4.15|F||||||F

OBX|55|ST|158608^MDC_HDIALY_DIALYSATE_NAME^MDC|1.1.4.16|FMC smartbag 111.5||Bbraun Duosol 35||||F

OBX|56|NM|158808^MDC_HDIALY_DIALYSATE_CONC_ACETATE^MDC|1.1.4.17|3.00|mmol/L^MilliMolesPerLiter^UCUM|||||F

OBX|57|NM|158812^MDC_HDIALY_DIALYSATE_CONC_HCO3^MDC|1.1.4.18|35.0|mmol/L^MilliMolesPerLiter^UCUM|35 mEq/L||||F

OBX|58|NM|158816^MDC_HDIALY_DIALYSATE_CONC_CHLORIDE^MDC|1.1.4.19|108.00|mmol/L^MilliMolesPerLiter^UCUM|109 mEq/L||||F|||20191003085024+0000

OBX|59|NM|158820^MDC_HDIALY_DIALYSATE_CONC_MG^MDC|1.1.4.20|0.5|mmol/L^MilliMolesPerLiter^UCUM|1.0 mEq/L||||F|||20191003085024+0000

OBX|60|NM|158824^MDC_HDIALY_DIALYSATE_CONC_CA^MDC|1.1.4.21|1.50|mmol/L^MilliMolesPerLiter^UCUM|3 mEq/L||||F|||20191003085024+0000

OBX|61|NM|158828^MDC_HDIALY_DIALYSATE_CONC_CITRATE^MDC|1.1.4.22|0.0|mmol/L^MilliMolesPerLiter^UCUM|||||F

OBX|62|NM|158832^MDC_HDIALY_DIALYSATE_CONC_GLU^MDC|1.1.4.23|1.00|mmol/L^MilliMolesPerLiter^UCUM|1 g/L||||F

OBX|63|NM|158836^MDC_HDIALY_DIALYSATE_CONC_K^MDC|1.1.4.24|1.00|mmol/L^MilliMolesPerLiter^UCUM|0 mEq/L||||F|||20191003085024+0000

OBX|64|NM|158840^MDC_HDIALY_DIALYSATE_CONC_NA^MDC|1.1.4.25|138|mmol/L^MilliMolesPerLiter^UCUM|140 mEq/L||||F|||20191003085024+0000

OBX|65|NM|16936056^MDC_HDIALY_DIALYSATE_CONC_NA_SETTING^MDC|1.1.4.26|140|mmol/L^MilliMolesPerLiter^UCUM|||||F
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OBX|66|ST|158609^MDC_HDIALY_DIALYSATE_CONC_NA_MODE^MDC|1.1.4.27|CONST||||||F

OBX|67|NM|158844^MDC_HDIALY_DIALYSATE_CONC_PH^MDC|1.1.4.28|7.0|[pH]^pH^UCUM|||||F

OBX|68|NM|158848^MDC_HDIALY_DIALYSATE_VOL_DELIV^MDC|1.1.4.29|24.34|L^liter^UCUM|||||F

OBX|69|ST|158610^MDC_HDIALY_FILTER_NAME^MDC|1.1.5.1|NxStage CAR125||||||F

OBX|70|NM|158852^MDC_HDIALY_FILTER_TRANSMEMBRANE_PRESS^MDC|1.1.5.2|35|mm[Hg]^Millimeters of
    Mercury^UCUM|||||F

OBX|71|NM|158611^MDC_HDIALY_FILTER_NUM^MDC|1.1.5.3|1|| ||||F

OBX|72|ST|158612^MDC_HDIALY_FILTER_UDI^MDC|1.1.5.4| (01)00842289101845(17)201200(10)LOT00606||
    ||||F

OBX|73|ST|158613^MDC_HDIALY_RF_DILUTION_LOCATION^MDC|1.1.6.1|PREF-POSTF||||||F

OBX|74|ST|158614^MDC_HDIALY_RF_POST_FILTER_NAME^MDC|1.1.6.2|multiBIC|| ||||F

OBX|75|NM|158856^MDC_HDIALY_RF_POST_FILTER_CONC_ACETATE^MDC|1.1.6.3|0|mmol/L^MilliMolesPerLiter^
    UCUM|||||F

OBX|76|NM|158860^MDC_HDIALY_RF_POST_FILTER_CONC_HCO3^MDC|1.1.6.4|35.0|mmol/L^MilliMolesPerLiter^
    UCUM|35 mEq/L||||F

OBX|77|NM|158864^MDC_HDIALY_RF_POST_FILTER_CONC_CHLORIDE^MDC|1.1.6.5|111.00|mmol/L^MilliMolesPer
    Liter^UCUM|109 mEq/L||||F|||20191003085024+0000

OBX|78|NM|158868^MDC_HDIALY_RF_POST_FILTER_CONC_MG^MDC|1.1.6.6|0.5|mmol/L^MilliMolesPerLiter^UCU
    M|1.0 mEq/L||||F|||20191003085024+0000

OBX|79|NM|158824^MDC_HDIALY_DIALYSATE_CONC_CA^MDC|1.1.6.7|1.50|mmol/L^MilliMolesPerLiter^UCUM|3
    mEq/L||||F|||20191003085024+0000

OBX|80|NM|158876^MDC_HDIALY_RF_POST_FILTER_CONC_CITRATE^MDC|1.1.6.8|0.0|mmol/L^MilliMolesPerLite
    r^UCUM|||||F

OBX|81|NM|158880^MDC_HDIALY_RF_POST_FILTER_CONC_GLU^MDC|1.1.6.9|5.55|mmol/L^MilliMolesPerLiter^U
    CUM|1 g/L||||F

OBX|82|NM|158884^MDC_HDIALY_RF_POST_FILTER_CONC_K^MDC|1.1.6.10|2.00|mmol/L^MilliMolesPerLiter^UC
    UM|0 mEq/L||||F|||20191003085024+0000

OBX|83|NM|158888^MDC_HDIALY_RF_POST_FILTER_CONC_NA^MDC|1.1.6.11|140|mmol/L^MilliMolesPerLiter^UC
    UM|140 mEq/L||||F|||20191003085024+0000

OBX|84|NM|158892^MDC_HDIALY_RF_POST_FILTER_FLOW_RATE^MDC|1.1.6.12|60|ml/min^milliliter per
    minute^UCUM|||||F

OBX|85|NM|16936108^MDC_HDIALY_RF_POST_FILTER_FLOW_RATE_SETTING^MDC|1.1.6.13|60|ml/min^milliliter
    per minute^UCUM|||||F

OBX|86|NM|158895^MDC_HDIALY_RF_POST_FILTER_FLOW_RATE_MEAN^MDC|1.1.6.14|60|ml/min^milliliter per
    minute^UCUM|||||F

OBX|87|NM|158896^MDC_HDIALY_RF_POST_FILTER_TEMP^MDC|1.1.6.15|39.9|Cel^degree Celsius^UCUM|||||F

OBX|88|NM|16936112^MDC_HDIALY_RF_POST_FILTER_TEMP_SETTING^MDC|1.1.6.16|41.0|Cel^degree
    Celsius^UCUM|||||F

OBX|89|NM|158900^MDC_HDIALY_RF_POST_FILTER_VOL^MDC|1.1.6.17|6.00|L^liter^UCUM|||||F

OBX|90|NM|16936116^MDC_HDIALY_RF_POST_FILTER_VOL_SETTING^MDC|1.1.6.18|12.00|L^liter^UCUM|||||F

OBX|91|ST|158615^MDC_HDIALY_RF_PRE_FILTER_NAME^MDC|1.1.6.19|multiBIC|| ||||F

OBX|92|NM|158904^MDC_HDIALY_RF_PRE_FILTER_CONC_ACETATE^MDC|1.1.6.20|0|mmol/L^MilliMolesPerLiter^
    UCUM|||||F

OBX|93|NM|158908^MDC_HDIALY_RF_PRE_FILTER_CONC_HCO3^MDC|1.1.6.21|35.0|mmol/L^MilliMolesPerLiter^
    UCUM|35 mEq/L||||F

OBX|94|NM|158912^MDC_HDIALY_RF_PRE_FILTER_CONC_CHLORIDE^MDC|1.1.6.22|111.00|mmol/L^MilliMolesPer
    Liter^UCUM|109 mEq/L||||F|||20191003085024+0000

OBX|95|NM|158916^MDC_HDIALY_RF_PRE_FILTER_CONC_MG^MDC|1.1.6.23|0.5|mmol/L^MilliMolesPerLiter^UCU
    M|1.0 mEq/L||||F|||20191003085024+0000

OBX|96|NM|158920^MDC_HDIALY_RF_PRE_FILTER_CONC_CA^MDC|1.1.6.24|1.50|mmol/L^MilliMolesPerLiter^UC
    UM|3 mEq/L||||F|||20191003085024+0000

OBX|97|NM|158924^MDC_HDIALY_RF_PRE_FILTER_CONC_CITRATE^MDC|1.1.6.25|0.0|mmol/L^MilliMolesPerLite
    r^UCUM|||||F

OBX|98|NM|158928^MDC_HDIALY_RF_PRE_FILTER_CONC_GLU^MDC|1.1.6.26|5.55|mmol/L^MilliMolesPerLiter^U
    CUM|1 g/L||||F
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OBX|99|NM|158932^MDC_HDIALY_RF_PRE_FILTER_CONC_K^MDC|1.1.6.27|2.00|mmol/L^MilliMolesPerLiter^UCUM|0 mEq/L||||F|||20191003085024+0000
OBX|100|NM|158936^MDC_HDIALY_RF_PRE_FILTER_CONC_NA^MDC|1.1.6.28|140|mmol/L^MilliMolesPerLiter^UCUM|140 mEq/L||||F|||20191003085024+0000
OBX|101|NM|158940^MDC_HDIALY_RF_PRE_FILTER_FLOW_RATE^MDC|1.1.6.29|60|ml/min^milliliter per minute^UCUM|||||F
OBX|102|NM|16936156^MDC_HDIALY_RF_PRE_FILTER_FLOW_RATE_SETTING^MDC|1.1.6.30|60|ml/min^milliliter per minute^UCUM|||||F
OBX|103|NM|158943^MDC_HDIALY_RF_PRE_FILTER_FLOW_RATE_MEAN^MDC|1.1.6.31|60|ml/min^milliliter per minute^UCUM|||||F
OBX|104|NM|158944^MDC_HDIALY_RF_PRE_FILTER_TEMP^MDC|1.1.6.32|39.9|Cel^degree Celsius^UCUM|||||F
OBX|105|NM|16936160^MDC_HDIALY_RF_PRE_FILTER_TEMP_SETTING^MDC|1.1.6.33|41.0|Cel^degree Celsius^UCUM|||||F
OBX|106|NM|158948^MDC_HDIALY_RF_PRE_FILTER_VOL^MDC|1.1.6.34|1.23|L^liter^UCUM|||||F
OBX|107|NM|16936164^MDC_HDIALY_RF_PRE_FILTER_VOL_SETTING^MDC|1.1.6.35|3.00|L^liter^UCUM|||||F
OBX|108|NM|158952^MDC_HDIALY_RF_CONV_CLEARANCE^MDC|1.1.6.36|31.6|ml/min^milliliter per minute^UCUM|||||F
OBX|109|ST|198246^MDC_EVT_HDIALY_RF_EXCESS_DELIV^MDC|1.1.6.37|F||||||F
OBX|110|ST|198248^MDC_EVT_HDIALY_RF_INSUFF_DELIV^MDC|1.1.6.38|F||||||F
OBX|111|NM|16936172^MDC_HDIALY_RF_PRE_POST_FLOW_RATIO_SETTING^MDC|1.1.6.39|3.00||||||F
OBX|112|NM|158960^MDC_HDIALY_RF_BOLUS_RATE^MDC|1.1.6.40|0|ml/min^milliliter per minute^UCUM|||||F
OBX|113|NM|16936180^MDC_HDIALY_RF_BOLUS_VOL_SETTING^MDC|1.1.6.42|3.00|mL^milliliter^UCUM|||||F
OBX|114|NM|158968^MDC_HDIALY_RF_BOLUS_VOL_DELIVERED^MDC|1.1.6.41|0.00|mL^milliliter^UCUM|||||F
OBX|115|ST|158616^MDC_HDIALY_RF_FLOW_MODE^MDC|1.1.6.43|CONST||||||F
OBX|116|ST|158617^MDC_HDIALY_RF_SOURCE^MDC|1.1.6.44|BAG||||||F
OBX|117|ST|198252^MDC_EVT_HDIALY_SAFETY_ART_AIR_DETECT^MDC|1.1.7.1|F||||||F
OBX|118|ST|198254^MDC_EVT_HDIALY_SAFETY_DIALYSATE_AIR_DETECT^MDC|1.1.7.2|F||||||F
OBX|119|ST|198256^MDC_EVT_HDIALY_SAFETY_DIALYSATE_COMPOSITION^MDC|1.1.7.3|F||||||F
OBX|120|ST|198258^MDC_EVT_HDIALY_SAFETY_SYSTEM_GENERAL^MDC|1.1.7.4|F||||||F
OBX|121|ST|198216^MDC_EVT_SELFTEST_FAILURE^MDC|1.1.7.5|F||||||F
OBX|122|ST|198260^MDC_EVT_HDIALY_SAFETY_VEN_ACCESS^MDC|1.1.7.6|F||||||F
OBX|123|ST|198262^MDC_EVT_HDIALY_SAFETY_VEN_AIR_DETECT^MDC|1.1.7.7|F||||||F
OBX|124|ST|198264^MDC_EVT_HDIALY_SAFETY_WETNESS_DETECT_ALERT^MDC|1.1.7.8|F||||||F
OBX|125|ST|198266^MDC_EVT_HDIALY_SAFETY_WETNESS_DETECT_ERROR^MDC|1.1.7.9|F||||||F
OBX|126|NM|68489^MDC_ATTR_ALERT_ID_NUM^MDC|1.1.7.10|0||||||F
OBX|127|ST|68546^MDC_ATTR_ALERT_TEXT^MDC|1.1.7.11|||||||F
OBX|128|NM|158972^MDC_HDIALY_THERAPY_MASS_TRF_AREA_COEFF^MDC|1.1.8.1|700||||||F
OBX|129|NM|158976^MDC_HDIALY_THERAPY_ACCESS_FLOW^MDC|1.1.8.2|250|ml/min^milliliter per minute^UCUM|||||F
OBX|130|NM|158980^MDC_HDIALY_THERAPY_RATIO_EKT_OVER_V_DELIVERED^MDC|1.1.8.4|1.1|%^Percent^UCUM|||||F
OBX|131|NM|158984^MDC_HDIALY_THERAPY_KT_DELIVERED^MDC|1.1.8.5|42.0|L^liter^UCUM|||||F
OBX|132|NM|158988^MDC_HDIALY_THERAPY_RATIO_SPKT_OVER_V_DELIVERED^MDC|1.1.8.6|1.1|%^Percent^UCUM|||||F
OBX|133|ST|198268^MDC_EVT_HDIALY_THERAPY_PAT_TX_GENERAL^MDC|1.1.8.7|F||||||F
OBX|134|NM|158992^MDC_HDIALY_THERAPY_RATIO_KT_OVER_V_GOAL^MDC|1.1.8.10|1.21|%^Percent^UCUM|||||F
OBX|135|NM|159019^MDC_HDIALY_THERAPY_UREA_CLEARANCE_MEAN^MDC|1.1.8.11|70||||||F
OBX|136|NM|159000^MDC_HDIALY_THERAPY_BODY_START_WT^MDC|1.1.8.12|75.9|kg^kilograms^UCUM|||||F
OBX|137|NM|159004^MDC_HDIALY_THERAPY_PCT_RECIRC^MDC|1.1.8.13|20|%^Percent^UCUM|||||F
```

```
OBX|138|NM|159008^MDC_HDIALY_THERAPY_PLASMA_NA_CONC^MDC|1.1.8.14|140|mmol/L^MilliMolesPerLiter^UCUM|||||F
OBX|139|NM|159012^MDC_HDIALY_THERAPY_RATIO_SPKT_OVER_V_PROJECTED^MDC|1.1.8.16|1.1|%^Percent^UCUM|||||F
OBX|140|ST|158618^MDC_HDIALY_THERAPY_COMPLETE_METHOD^MDC|1.1.8.18|UF||||||F
OBX|141|ST|198270^MDC_EVT_HDIALY_THERAPY_TX_END_TIME^MDC|1.1.8.19|F||||||F
OBX|142|NM|159016^MDC_HDIALY_THERAPY_UREA_CLEARANCE^MDC|1.1.8.20|196||||||F
OBX|143|NM|159020^MDC_HDIALY_THERAPY_BODY_END_WT^MDC|1.1.8.21|75.9|kg^kilograms^UCUM|||||F
OBX|144|ST|198272^MDC_EVT_HDIALY_UF_LO^MDC|1.1.9.1|F||||||F
OBX|145|ST|198274^MDC_EVT_HDIALY_UF_NEG^MDC|1.1.9.2|F||||||F
OBX|146|NM|159024^MDC_HDIALY_UF_TIME_TO_TARGET^MDC|1.1.9.3|55|min^minutes^UCUM|||||F
OBX|147|NM|159028^MDC_HDIALY_UF_TARGET_VOL_TO_REMOVE^MDC|1.1.9.4|2000|ml^milliliter^UCUM|||||F
OBX|148|NM|159032^MDC_HDIALY_UF_ACTUAL_REMOVED_VOL^MDC|1.1.9.5|555|ml^milliliter^UCUM|||||F
OBX|149|ST|198276^MDC_EVT_HDIALY_UF_RATE_RANGE^MDC|1.1.9.6|F||||||F
OBX|150|ST|198278^MDC_EVT_HDIALY_UF_GOAL_MET^MDC|1.1.9.7|F||||||F
OBX|151|ST|158619^MDC_HDIALY_UF_MODE^MDC|1.1.9.8|CONST-WT||||||F
OBX|152|NM|159036^MDC_HDIALY_UF_RATE^MDC|1.1.9.9|100|ml/h^milliliter per hour^UCUM|||||F
OBX|153|NM|16936252^MDC_HDIALY_UF_RATE_SETTING^MDC|1.1.9.9|100|ml/h^milliliter per hour^UCUM|||||F
OBX|154|ST|198276^MDC_EVT_HDIALY_UF_RATE_RANGE^MDC|1.1.9.10|F||||||F
OBX|155|NM|16936257^MDC_HDIALY_UF_RATE_LIMIT_HIGH_SETTING^MDC|1.1.9.11|150|ml/h^milliliter per hour^UCUM|||||F
OBX|156|NM|16936259^MDC_HDIALY_UF_RATE_LIMIT_LOW_SETTING^MDC|1.1.9.12|90|ml/h^milliliter per hour^UCUM|||||F
OBX|157|NM|67979^MDC_ATTR_TIME_PD_MSMT^MDC|1.2.1.1|30|min^minutes^UCUM|||||F|||20191003085024+0000
OBX|158|ST|68135^MDC_ATTR_PT_BODY_POSN^MDC|1.2.1.2|SUPINE||||||F|||20191003085024+0000
OBX|159|NM|150022^MDC_PRESS_BLD_NONINV_DIA^MDC|1.2.1.3|80|mm[Hg]^Millimeters of Mercury^UCUM|||||F|||20191003085024+0000
OBX|160|NM|149546^MDC_PULS_RATE_NON_INV^MDC|1.2.1.4|70|{beats}/min^Beats Per Minuts^UCUM|||||F|||20191003085024+0000
OBX|161|NM|150023^MDC_PRESS_BLD_NONINV_MEAN^MDC|1.2.1.5|100|mm[Hg]^Millimeters of Mercury^UCUM|||||F|||20191003085024+0000
OBX|162|NM|150021^MDC_PRESS_BLD_NONINV_SYS^MDC|1.2.1.6|120|mm[Hg]^Millimeters of Mercury^UCUM|||||F|||20191003085024+0000
OBX|163|NM|150456^MDC_PULS_OXIM_SAT_O2^MDC|1.3.1.1|98|%^Percent^UCUM|||||F
OBX|164|NM|149530^MDC_PULS_OXIM_PULS_RATE^MDC|1.3.1.2|67|{beats}/min^Beats Per Minutes^UCUM|||||F
OBX|165|ST|196638^MDC_EVT_ERR^MDC|1.3.1.3|F||||||F
OBX|166|ST|158620^MDC_HDIALY_PLASMA_VOL_MARKER^MDC|1.4.1.1|NONE||||||F
OBX|167|ST|158621^MDC_HDIALY_PLASMA_VOL_PROFILE^MDC|1.4.1.2|FLAT||||||F
OBX|168|NM|160132^MDC_CONC_HCT_GEN^MDC|1.4.1.3|0.45|%{vol}^VolumePercent^UCUM|||||F
OBX|169|NM|160120^MDC_CONC_HB_GEN^MDC|1.4.1.4|13.6|g/dL^GramsPerDeciLiter^UCUM|||||F
OBX|170|NM|159044^MDC_HDIALY_REL_BLOOD_VOL^MDC|1.4.1.5|35|%^Percent^UCUM|||||F
OBX|171|NM|150316^MDC_SAT_O2^MDC|1.4.1.6|98|%^Percent^UCUM|||||F
```

4.3 EMR Response

The EMR responds with a simple Acknowledgement Message (ACK_R01_ACK). Although the response to a missing or rejected response is machine specific, this standard recommends the following actions:

1) If the EMR does not respond then the dialysis machine should retry the message. If no response is received for the retry, the dialysis machine should generate an alert locally.
2) If the EMR responds but rejects the PCD-01 message, the dialysis machine should generate an alert locally.

4.3.1 Message Structure

Segment	Meaning	Use	Card
MSH	Message Header	R	[1..1]
[{SFT}]	Software Segment	X	[0..0]
[UAC]	User Authentication Credential	X	[0..0]
MSA	Message Acknowledgement	R	[1..1]
ERR	Error	RE	[0..100]

4.3.2 Example 1 – Accepted Response

The following message is an example of an accepted PCD-01 message.

```
MSH|^~\&|EMR||||20191003092025+0000||ACK^R01^ACK|XX3657|P|2.6|||NE|NE
MSA|AA|20191003092024
```

4.3.3 Example 2 – Rejected Response

The following message is an example of a rejected PCD-01 message.

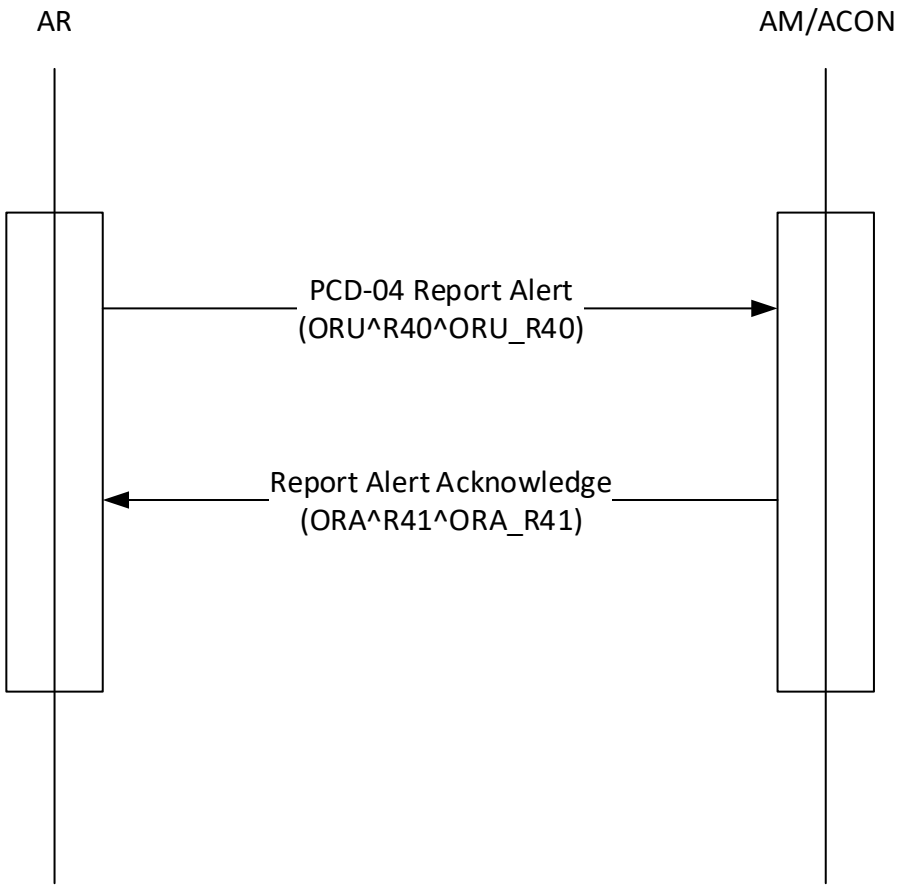
```
MSH|^~\&|EMR||||20191003092025+0000||ACK^R01^ACK|XX3657|P|2.6|||NE|NE
MSA|AR|20191003092024
ERR||PID^1^11^^9|103^Table Value Not Found|E
```

5 Reporting Alarm Information

5.1 Overview

The sending of Alarm Information to the EMR System is accomplished using the PCD-04 Transaction of the Patient Care Device (PCD) domain in the Device Enterprise Communication (DEC) IHE profile. In doing so, the Dialysis Machine acts as the Alert Reporter (AR) and the EMR is the Alert Manager (AM) and/or the Alert Consumer (ACON).

Figure 3 - AR sends Report Alert to AM and/or ACON as an HL7 ORU message.



The Dialysis Machine will report the alarm when the alarm state changes, when the alarm activity state changes, and periodically while it is active. The period of the "keep-alive" PCD-04 messages should be disclosed in the manufacturer's documents. It is recommended that this be between 10 and 30 seconds. The dialysis machine will send the appropriate parameters and measurements with each alarm. For example, when an Arterial Pressure High Alarm is reported, the message will contain the Arterial pressure Measurement and Arterial Pressure Upper Limit.

The ORU^R40 message represents a unitary alert, which is to be acknowledged as a whole by an ORA message. Multiple alerts requiring separate acknowledgement will be sent as individual messages.

The ORDER_OBSERVATION Segment Group which has OBR-49 value A (Alert provider when abnormal) conveys the alert observation(s). One or more OBX segments in this Segment Group will typically have OBX-8 Interpretation Codes value of LL. HH, or AA. At least one OBR segment shall have OBR-49 value A. Other ORDER_OBSERVATION Segment Groups within the message shall be considered supporting information for the alert observation(s).

5.2 Device Request

The PCD-04 Report Alert message is used to communicate ACM data from an Alert Reporter (AR) to Alert Manager (AM) and/or Alert Consumer (ACON). In addition, the Dialysis Machine sends a PCD-04 Message to the Device Observation Consumer (DOC) so that the information can be logged with the PCD-01 Message.

Common HL7 segments are defined in HL7 Data Elements. There are sections discussing considerations specific to PCD-04 where applicable.

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

5.2.1 Message Structure

Message Type - ORU^R40^ORU_R40

Segment	Meaning	Use	Card
MSH	Message Header	R	[1..1]
[{SFT}]	Software Segment	X	[0..0]
{	--- ALERT_begin		
[	--- PATIENT begin		
PID	Patient Identification	R	[1..1]
[	--- LOCATION begin		
PV1	Alert Location	O	[0..1]
]	--- LOCATION end		
]	--- PATIENT end		
{	--- ALERT_IDENTIFICATION begin		
[ORC]	Alert Order Common	X	[0..0]
{OBR}	Alert Identification	R	[1..*]
[{	--- ALERT_OBSERVATION begin		
{OBX}	Alert observations relative to OBR	R	[1..*]
{[NTE]}	Notes and Comments	X	[0..0]
}]	--- ALERT OBSERVATION end		
}	--- ALERT_IDENTIFICATION end		
}	--- ALERT end		

A single Report Alert [PCD-04] transaction contains at most one alert for a given patient. The PCD-04 message contains a single OBR segment that contains five OBX segments.

- OBX 1 identifies the type of alarm
- OBX 2 identifies the event source. For numeric values this include the object value and limits. This is the Source Column in Table 2.
- OBX 3 identifies the event phase
- OBX 4 identifies the alarm state
- OBX 5 identifies the alarm activity state

The first OBX (ID=1) identifies the type of alert.

HL7 Attribute Table - OBX Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	SI	R		Set ID – OBX
2	ID	C	0125	Value Type
3	CWE	R		Observation Identifier
4	ST	R		Observation Sub-ID
5	varies	R		Observation Value
6	CWE	R		Units

HL7 Attribute Table - OBX Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
7	ST	X		References Range
8	CWE	X		Interpretation Codes
9	NM	X		Probability
10	ID	X	0080	Nature of Abnormal Test
11	ID	R	0085	Observation Result Status
12	DTM	X		Effective Date of Reference Range
13	ST	X		User Defined Access Checks
14	DTM	X		Date/Time of the Observation
15	CWE	X		Producer's ID
16	XCN	X		Responsible Observer
17	CWE	X		Observation Method
18	EI	X		Equipment Instance Identifier
19	DTM	X		Date/Time of the Analysis
20	CWE	X	0163	Observation Site
21	EI	X		Observation Instance Identifier
22	CNE	X	0725	Mood Code
23	XON	X		Performing Organization Name
24	XAD	X		Performing Organization Address
25	XCN	X		Performing Organization Medical Director
26	ID	X	0909	Patient Results Release Category

OBX-1 Set ID

This field contains the sequence number. For this segement it will always be 1.

OBX-2 Value Type

This field defines the data type of OBX-5, Observation Value. For this segment the value will always be "CWE".

OBX-3 Observation Identifier

This field will be one of the following.

Field Value	Usage
196670^MDC_EVT_LO^MDC	This value is used when the alarm is generated because a measure value is below a numeric limit.
196648^MDC_EVT_HI^MDC	This value is used when the alarm is generated because a measure value is above a numeric limit.
196616^MDC_EVT_ALARM^MDC	This value is used when the alarm is not generated due to a numeric value.

OBX-4 Observation Sub-ID

This value will always be "1.0.0.0.1".

OBX-5 Observation Value

This field identifies the alarm being generate. For numeric values, this field is the value in the Source Column in Table 2. For non-numeric alarms, this field is the Event Identifier Column in Table 2.

For example, "198240^MDC_EVT_HDIALY_ANTICOAG_SYRINGE_SIZE^MDC"

"198242^MDC_EVT_HDIALY_BLD_PUMP_STOP^MDC"

OBX-8 Interpretation Codes

This field is used to provide the Alarm Priority and Alarm Type, and optionally the Abnormality Type.

Examples,

High Priority, Technical, Upper Limit Alarm H~ST~PH

Non-Numeric High Priority, Technical Alarm ST~PH

OBX-11 Observation Result Status

For this segment the value will always be "F".

The second OBX (ID=2) identifies the parameter and the reference range.

HL7 Attribute Table - OBX Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	SI	R		Set ID – OBX
2	ID	C	0125	Value Type
3	CWE	R		Observation Identifier
4	ST	R		Observation Sub-ID
5	varies	R		Observation Value
6	CWE	R		Units
7	ST	X		References Range
8	CWE	X		Interpretation Codes
9	NM	X		Probability
10	ID	X	0080	Nature of Abnormal Test
11	ID	R	0085	Observation Result Status
12	DTM	X		Effective Date of Reference Range
13	ST	X		User Defined Access Checks
14	DTM	X		Date/Time of the Observation
15	CWE	X		Producer's ID
16	XCN	X		Responsible Observer
17	CWE	X		Observation Method
18	EI	X		Equipment Instance Identifier
19	DTM	X		Date/Time of the Analysis
20	CWE	X	0163	Observation Site
21	EI	X		Observation Instance Identifier
22	CNE	X	0725	Mood Code
23	XON	X		Performing Organization Name
24	XAD	X		Performing Organization Address
25	XCN	X		Performing Organization Medical Director
26	ID	X	0909	Patient Results Release Category

OBX-1 Set ID

For this segment the value will always be 2.

OBX-2 Value Type

This field defines the data type of OBX-5, Observation Value. For numeric alarms, this value will be "NM". For non-numeric alarms, this value will be "CWE".

OBX-3 Observation Identifier

For numeric alarms, this field identifies the object being monitored. This object is identified in the Source Column in Table 2.

For non-numeric alarms, this field will always be "68480^MDC_ATTR_ALERT_SOURCE^MDC".

OBX-4 Observation Sub-ID

For numeric alarms, this field identifies the object being measured. This value is the Observation Sub ID of the object identified in the Source Column in Table 2.

For non-numeric alarms, this field identifies the VMD of the device generating the alarm. This value is the Observation Sub-ID of the object identified in the Source Column in Table 2.

In both cases, the observation sub-ID has ".2" appended to signify facet 2.

For example, the Therapy Outcomes VMD would be reported as "1.1.8.2".

OBX-5 Observation Value

For numeric alarms, this field contains the value of the object that resulted in the alarm.

For non-numeric alarms, this field contains the identifier of the VMD generating the alarm. This is identified in the Source Column in Table 2.

Example, "70967^MDC_DEV_HDIALY_THERAPY_OUTCOMES_CHAN^MDC".

OBX-6 Observation Units

For numeric alarms, this field contains the units of measure for the object.

For non-numeric alarms, this field is blank.

OBX-7 Reference Range

This field contains the alarm limits for numeric alarms. For non-numeric alarms this field is empty. Ranges can be specified in one of three ways.

	Format	Example
Upper Limit Only	> Upper	> 400
Lower Limit Only	< Lower	< -200
Upper and Lower Limit	Lower – Upper	20 - 400

OBX-11 Observation Result Status

For this segment the value will always be "F".

The third OBX (ID=3) identifies the event phase.

HL7 Attribute Table - OBX Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	SI	R		Set ID – OBX
2	ID	C	0125	Value Type
3	CWE	R		Observation Identifier
4	ST	R		Observation Sub-ID
5	varies	R		Observation Value
6	CWE	R		Units
7	ST	X		References Range
8	CWE	X		Interpretation Codes

HL7 Attribute Table - OBX Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
9	NM	X		Probability
10	ID	X	0080	Nature of Abnormal Test
11	ID	R	0085	Observation Result Status
12	DTM	X		Effective Date of Reference Range
13	ST	X		User Defined Access Checks
14	DTM	X		Date/Time of the Observation
15	CWE	X		Producer's ID
16	XCN	X		Responsible Observer
17	CWE	X		Observation Method
18	EI	X		Equipment Instance Identifier
19	DTM	X		Date/Time of the Analysis
20	CWE	X	0163	Observation Site
21	EI	X		Observation Instance Identifier
22	CNE	X	0725	Mood Code
23	XON	X		Performing Organization Name
24	XAD	X		Performing Organization Address
25	XCN	X		Performing Organization Medical Director
26	ID	X	0909	Patient Results Release Category

OBX-1 Set ID

This field contains the sequence number. For this segement it will always be 3.

OBX-2 Value Type

This field defines the data type of OBX-5, Observation Value. For this segment the value will always be "ST".

OBX-3 Observation Identifier

This field will always be "68481^MDC_ATTR_EVENT_PHASE^MDC".

OBX-4 Observation Sub-ID

This value will always be "1.0.0.0.3".

OBX-5 Observation Value

This value will always be one of the following.

- start start of an interval event/alert – an end is expected
- continue continuation of an ongoing interval event/alert
- end end of an interval event/alert

OBX-11 Observation Result Status

For this segment the value will always be "F".

The third OBX (ID=4) identifies the alarm state.

HL7 Attribute Table - OBX Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	SI	R		Set ID – OBX
2	ID	C	0125	Value Type
3	CWE	R		Observation Identifier
4	ST	R		Observation Sub-ID

HL7 Attribute Table - OBX Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
5	varies	R		Observation Value
6	CWE	R		Units
7	ST	X		References Range
8	CWE	X		Interpretation Codes
9	NM	X		Probability
10	ID	X	0080	Nature of Abnormal Test
11	ID	R	0085	Observation Result Status
12	DTM	X		Effective Date of Reference Range
13	ST	X		User Defined Access Checks
14	DTM	X		Date/Time of the Observation
15	CWE	X		Producer's ID
16	XCN	X		Responsible Observer
17	CWE	X		Observation Method
18	EI	X		Equipment Instance Identifier
19	DTM	X		Date/Time of the Analysis
20	CWE	X	0163	Observation Site
21	EI	X		Observation Instance Identifier
22	CNE	X	0725	Mood Code
23	XON	X		Performing Organization Name
24	XAD	X		Performing Organization Address
25	XCN	X		Performing Organization Medical Director
26	ID	X	0909	Patient Results Release Category

OBX-1 Set ID

This field contains the sequence number. For this segement it will always be 4.

OBX-2 Value Type

This field defines the data type of OBX-5, Observation Value. For this segment the value will always be "ST".

OBX-3 Observation Identifier

This field will always be "68482^MDC_ATTR_ALARM_STATE^MDC".

OBX-4 Observation Sub-ID

This value will always be "1.0.0.0.4".

OBX-5 Observation Value

This value will one of the following:

- off
- inactive
- active
- latched

OBX-11 Observation Result Status

For this segment the value will always be "F".

The third OBX (ID=5) identifies the alarm activity state.

HL7 Attribute Table - OBX Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	SI	R		Set ID – OBX
2	ID	C	0125	Value Type
3	CWE	R		Observation Identifier
4	ST	R		Observation Sub-ID
5	varies	R		Observation Value
6	CWE	R		Units
7	ST	X		References Range
8	CWE	X		Interpretation Codes
9	NM	X		Probability
10	ID	X	0080	Nature of Abnormal Test
11	ID	R	0085	Observation Result Status
12	DTM	X		Effective Date of Reference Range
13	ST	X		User Defined Access Checks
14	DTM	X		Date/Time of the Observation
15	CWE	X		Producer's ID
16	XCN	X		Responsible Observer
17	CWE	X		Observation Method
18	EI	X		Equipment Instance Identifier
19	DTM	X		Date/Time of the Analysis
20	CWE	X	0163	Observation Site
21	EI	X		Observation Instance Identifier
22	CNE	X	0725	Mood Code
23	XON	X		Performing Organization Name
24	XAD	X		Performing Organization Address
25	XCN	X		Performing Organization Medical Director
26	ID	X	0909	Patient Results Release Category

OBX-1 Set ID

This field contains the sequence number. For this segement it will always be 5.

OBX-2 Value Type

This field defines the data type of OBX-5, Observation Value. For this segment the value will always be "ST".

OBX-3 Observation Identifier

This field will always be "68483^MDC_ATTR_ALARM_INACTIVATION_STATE^MDC".

OBX-4 Observation Sub-ID

This value will always be "1.0.0.0.5".

OBX-5 Observation Value

This value will one of the following:

- enabled
- audio-paused
- audio-off
- alarm-paused
- alarm-off
- alert-acknowledged (IEC 60601-1-8 Amendment 1; CP126)

OBX-11 Observation Result Status

For this segment the value will always be "F".

5.2.2 Example 1 - Alarm Initiation

The following message is an example of a Venous Pressure Low Alarm.

```
MSH|^~\&|ACME_Dialysis_Machine^080019FFFE3ED02D^EUI-
    64||||20191003092025+0000||ORU^R40^ORU_R40|20191003092024|P|2.6|||AL|NE|||||IHE_PCD_001^IHEPC
    D^1.3.6.1.4.1.19376.1.6.1.4.1^ISO

PID|||Scrubber 2000/SC678932^^^"^U||^^^^^^U

OBR|1||080019FFFE3ED02D20110602045842^ACME_Dialysis_Machine^080019FFFE3ED02D^EUI-
    64|196616^MDC_EVT_ALARM^MDC|||20191003092024+0000

OBX|1|ST|70929^MDC_DEV_HDIALY_MACHINE_MDS|1.0.0|||||||F

OBX|2|ST|70934^MDC_DEV_HDIALY_VMD|1.1|||||||F

OBX|3|CWE|196670^MDC_EVT_LO^MDC|1.0.0.0.1|158776^MDC_HDIALY_BLD_PUMP_PRESS_VEN^MDC|||PH~SP|||F

OBX|4|NM|158776^MDC_HDIALY_BLD_PUMP_PRESS_VEN^MDC|1.1.3.15.2|15|mm[Hg]^Millimeters of
    Mercury^UCUM |20-400||||F

OBX|5|ST|68481^MDC_ATTR_EVENT_PHASE^MDC|1.0.0.0.3|start||||||F

OBX|6|ST|68482^MDC_ATTR_ALARM_STATE^MDC|1.0.0.0.4|active||||||F

OBX|7|ST|68483^MDC_ATTR_ALARM_INACTIVATION_STATE^MDC|1.0.0.0.5|enabled||||||F
```

5.2.3 Example 2 - Alarm Cessation

The following message shows the cessation of a Blood Pump Stopped alarm.

```
MSH|^~\&|ACME_Dialysis_Machine^080019FFFE3ED02D^EUI-
    64||||20191003092025+0000||ORU^R40^ORU_R40|20191003092024|P|2.6|||AL|NE|||||IHE_PCD_001^IHEPC
    D^1.3.6.1.4.1.19376.1.6.1.4.1^ISO

PID|||Scrubber 2000/SC678932^^^"^U||^^^^^^U

OBR|1||080019FFFE3ED02D20110602045842^ACME_Dialysis_Machine^080019FFFE3ED02D^EUI-
    64|196616^MDC_EVT_ALARM^MDC|||20191003092024+0000

OBX|1|ST|70929^MDC_DEV_HDIALY_MACHINE_MDS|1.0.0|||||||F

OBX|2|ST|70934^MDC_DEV_HDIALY_VMD|1.1|||||||F

OBX|3|CWE|196616^MDC_EVT_ALARM^MDC|1.0.0.0.1|198242^MDC_EVT_HDIALY_ALARM_BLD_PUMP_STOP^MDC||||||
    F

OBX|4|CWE|68480^MDC_ATTR_ALERT_SOURCE^MDC|1.1.3.0.2|||||||F

OBX|5|ST|68481^MDC_ATTR_EVENT_PHASE^MDC|1.0.0.0.3|end||||||F

OBX|6|ST|68482^MDC_ATTR_ALARM_STATE^MDC|1.0.0.0.4|inactive||||||F

OBX|7|ST|68483^MDC_ATTR_ALARM_INACTIVATION_STATE^MDC|1.0.0.0.5|enabled||||||F
```

5.2.4 Example 3 - Alarm Mute

The following message shows a VP Low Alarm that has been muted by the user.

```
MSH|^~\&|ACME_Dialysis_Machine^080019FFFE3ED02D^EUI-
    64||||20191003092025+0000||ORU^R40^ORU_R40|20191003092024|P|2.6|||AL|NE|||||IHE_PCD_001^IHEPC
    D^1.3.6.1.4.1.19376.1.6.1.4.1^ISO

PID|||Scrubber 2000/SC678932^^^"^U||^^^^^^U

OBR|1||080019FFFE3ED02D20110602045842^ACME_Dialysis_Machine^080019FFFE3ED02D^EUI-
    64|196616^MDC_EVT_ALARM^MDC|||20191003092024+0000

OBX|1|ST|70929^MDC_DEV_HDIALY_MACHINE_MDS|1.0.0|||||||F
```

```
OBX|2|ST|70934^MDC_DEV_HDIALY_VMD|1.1|||||||F

OBX|3|CWE|196670^MDC_EVT_LO^MDC|1.0.0.0.1|158776^MDC_HDIALY_BLD_PUMP_PRESS_VEN^MDC|||PH~SP|||F

OBX|4|NM|158776^MDC_HDIALY_BLD_PUMP_PRESS_VEN^MDC|1.1.3.15.2|15|mm[Hg]^Millimeters of
    Mercury^UCUM |20-400||||F

OBX|5|ST|68481^MDC_ATTR_EVENT_PHASE^MDC|1.0.0.0.3|continue||||||F

OBX|6|ST|68482^MDC_ATTR_ALARM_STATE^MDC|1.0.0.0.4|active||||||F

OBX|7|ST|68483^MDC_ATTR_ALARM_INACTIVATION_STATE^MDC|1.0.0.0.5|audio-paused||||||F
```

The following message shows a VP Low Alarm whose mute has expired.

```
MSH|^~\&|ACME_Dialysis_Machine^080019FFFE3ED02D^EUI-
    64||||20191003092025+0000||ORU^R40^ORU_R40|20191003092024|P|2.6|||AL|NE|||||IHE_PCD_001^IHEPC
    D^1.3.6.1.4.1.19376.1.6.1.4.1^ISO

PID|||Scrubber 2000/SC678932^^^"^U||^^^^^^U

OBR|1||080019FFFE3ED02D20110602045842^ACME_Dialysis_Machine^080019FFFE3ED02D^EUI-
    64|196616^MDC_EVT_ALARM^MDC|||20191003092024+0000

OBX|1|ST|70929^MDC_DEV_HDIALY_MACHINE_MDS|1.0.0|||||||F

OBX|2|ST|70934^MDC_DEV_HDIALY_VMD|1.1|||||||F

OBX|3|CWE|196670^MDC_EVT_LO^MDC|1.0.0.0.1|158776^MDC_HDIALY_BLD_PUMP_PRESS_VEN^MDC|||PH~SP|||F

OBX|4|NM|158776^MDC_HDIALY_BLD_PUMP_PRESS_VEN^MDC|1.1.3.15.2|15|mm[Hg]^Millimeters of
    Mercury^UCUM |20-400||||F

OBX|5|ST|68481^MDC_ATTR_EVENT_PHASE^MDC|1.0.0.0.3|continue||||||F

OBX|6|ST|68482^MDC_ATTR_ALARM_STATE^MDC|1.0.0.0.4|active||||||F

OBX|7|ST|68483^MDC_ATTR_ALARM_INACTIVATION_STATE^MDC|1.0.0.0.5|enabled||||||F
```

5.3 EMR Response

The EMR responds with a Report Alert Acknowledgement (ORA^R41^ORA_R41).

5.3.1 Message Structure

Message Type - ORA^R41^ORA_R41

Segment	Meaning	Use	Card
MSH	Message Header	R	[1..1]
[{SFT}]	Software Segment	X	[0..0]
[UAC]	User Authentication Credential	X	[0..0]
MSA	Message Acknowledgement	R	[1..1]
ERR	Error	RE	[0..100]
[{PRT}]	Participation (Acknowledging User)	O	[0..1]

5.3.1 Example 1 – Accepted Response

The following message is an example of an accepted PCD-04 message.

```
MSH|^~\&|EMR||||20191003092025+0000||ACK^R40^ACK|XX3657|P|2.6|||NE|NE

MSA|AA|20191003092024
```

6 HL7 Data Elements

The information contained in this section is a subset of the full HL7 Specification. Only segments used by this standard are shown. Restrictions that are specific to this specification are identified for each segment.

6.1 Tables

The values contained in the tables in this section may be a subset of the values supported by the HL7 specification. Only values supported or used by Dialysis Machines are shown.

HL7 Table 0008 - Acknowledgment Code

Value	Description
AA	Original mode: Application Accept - Enhanced mode: Application acknowledgment: Accept
AE	Original mode: Application Error - Enhanced mode: Application acknowledgment: Error
AR	Original mode: Application Reject - Enhanced mode: Application acknowledgment: Reject
CA	Enhanced mode: Accept acknowledgment: Commit Accept
CE	Enhanced mode: Accept acknowledgment: Commit Error
CR	Enhanced mode: Accept acknowledgment: Commit Reject

HL7 Table 0038 - Order status

Value	Description
A	Some, but not all, results available
CA	Order was canceled
CM	Order is completed
DC	Order was discontinued
ER	Error, order not found
HD	Order is on hold
IP	In process, unspecified
RP	Order has been replaced
SC	In process, scheduled

HL7 Table 0085 - Observation result status codes interpretation

Value	Description
F	Final results; Can only be changed with a corrected result.

HL7 Table 0123 - Result status for OBR segment

Value	Description
O	Order received; specimen not yet received
I	No results available; specimen received, procedure incomplete
S	No results available; procedure scheduled, but not done

Value	Description
A	Some, but not all, results available
P	Preliminary: A verified early result is available, final results not yet obtained
C	Correction to results
R	Results stored; not yet verified
F	Final results; results stored and verified. Can only be changed with a corrected result.
X	No results available; Order canceled.
Y	No order on record for this test. (Used only on queries)
Z	No record of this patient. (Used only on queries)

HL7 Table 0125 - Value type

Value	Description
DT	Date
NM	Numeric
ST	String Data.
TM	Time

HL7 Table 0155 - Accept/application acknowledgment conditions

Value	Description
AL	Always

User Defined Table 0396 – Coding Systems

Value	Description
MDC	ISO/IEEE
UCUM	Unified Code for Units of Measure (UCUM)

HL7 table 0357 – Message Error Condition Codes

Value	Description	Comment
0	Message accepted	Success. Optional, as the AA conveys success. Used for systems that shall always return a status code.
100	Segment sequence error	Error: The message segments were not in the proper order, or required segments are missing.
101	Required field missing	Error: A required field is missing from a segment

Value	Description	Comment
102	Data type error	Error: The field contained data of the wrong data type, e.g. an NM field contained "FOO".
103	Table value not found	Error: A field of data type ID or IS was compared against the corresponding table, and no match was found.
200	Unsupported message type	Rejection: The Message Type is not supported.
201	Unsupported event code	Rejection: The Event Code is not supported.
202	Unsupported processing id	Rejection: The Processing ID is not supported.
203	Unsupported version id	Rejection: The Version ID is not supported.
204	Unknown key identifier	Rejection: The ID of the patient, order, etc., was not found. Used for transactions *other than* additions, e.g. transfer of a non-existent patient.
205	Duplicate key identifier	Rejection: The ID of the patient, order, etc., already exists. Used in response to addition
206	Application record locked	Rejection: The transaction could not be performed at the application storage level, e.g., database locked.
207	Application internal error	Rejection: A catchall for internal errors not explicitly covered by other codes.

HL7 table 0516 – Error Severity

Value	Description	Comment
W	Warning	Transaction successful, but there may issues
I	Information	Transaction was successful but includes information e.g., inform patient
E	Error	Transaction was unsuccessful

6.2 Segments

6.2.1 MSA – Message Acknowledgement Segment

The MSA segment contains INFORMATION sent while acknowledging another message. This message is sent from the EMR System to the Dialysis Machine. Although other fields may be present, the Dialysis Machine processes MSA-1 Acknowledgement Code and MSA-2 Message Control ID.

HL7 Attribute Table - MSA Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	ID	R	0008	Acknowledgment Code
2	ST	R		Message Control ID
3		W		Text Message
4	NM	O		Expected Sequence Number
5		W		Delayed Acknowledgment Type
6		W		Error Condition
7	NM	O		Message Waiting Number
8	ID	O	0520	Message Waiting Priority

MSA-1 Acknowledgment Code (ID)

HL7 Definition: This field contains an acknowledgment code, see message processing rules. Refer to HL7 Table 0008 - Acknowledgment Code for valid values.

In this table, the value "CA" corresponds to "Enhanced mode: Accept acknowledgment: Commit Accept." This value means that the receiving system has committed the message to safe storage in a manner that releases the sending system from the need to resend the message. "CR" means that a message was rejected for a message uniquely identified by the information in MSH-9, MSH-12, MSH-11, MSH-21. "CE" is a message processing error or failure condition.

This Specification: The Dialysis Machine accepts both original and enhanced mode responses. The response of the Dialysis Machine to an Error or Rejected message is device and manufacturer specific and is not covered by this guide.

MSA-2 Message Control ID (ST)

HL7 Definition: This field contains the message control ID of the message sent by the sending system. It allows the sending system to associate this response with the message for which it is intended.

This Specification: Note that the combination of the values in *MSA-2 Message Control ID* and *MSH-6 Receiving Facility* should be unique to the recipient of the acknowledgement message (i.e., the Order Fulfiller).

Note on Element Length: The element length for MSA-2 has been extended to 50 characters from the HL7-prescribed length of 20 characters. This element has been extended to accommodate the extended element length of MSH-10 Message Control ID in the ORU message types.

6.2.2 MSH – Message Header Segment

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

HL7 Attribute Table - MSH Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	ST	R		Field Separator
2	ST	R		Encoding Characters
3	HD	R	0361	Sending Application
4	HD	X	0362	Sending Facility
5	HD	X	0361	Receiving Application
6	HD	X	0362	Receiving Facility
7	DTM	R		Date/Time of Message
8	ST	X		Security
9	MSG	R		Message Type
10	ST	R		Message Control ID
11	PT	R		Processing ID
12	VID	R		Version ID
13	NM	X		Sequence Number
14	ST	X		Continuation Pointer
15	ID	X	0155	Accept Acknowledgment Type
16	ID	X	0155	Application Acknowledgment Type
17	ID	X	0399	Country Code
18	ID	X	0211	Character Set
19	CWE	X		Principal Language Of Message

HL7 Attribute Table - MSH Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
20	ID	X	0356	Alternate Character Set Handling Scheme
21	EI	R		Message Profile Identifier
22	XON	X		Sending Responsible Organization
23	XON	X		Receiving Responsible Organization
24	HD	X		Sending Network Address
25	HD	X		Receiving Network Address

MSH-1 Field separator (ST)

HL7 Definition: This field contains the separator between the segment ID and the first real field. As such it serves as the separator and defines the character to be used as a separator for the rest of the message. Recommended value is | (ASCII 124).

This Specification: This value will be | (ASCII 124).

MSH-2 Encoding characters (ST)

HL7 Definition: This field contains four characters in the following order: the component separator, repetition separator, escape character, and subcomponent separator. Recommended values are ^~\& (ASCII 94, 126, 92, and 38, respectively).

This Specification: This value will be recommended values are ^~\& (ASCII 94, 126, 92, and 38, respectively).

MSH-3 Sending Application (HD)

HL7 Definition: This field uniquely identifies the sending application among all other applications within the network enterprise. The network enterprise consists of all those applications that participate in the exchange of HL7 messages within the enterprise.

This Specification: This value will name of the dialysis machine and the Extended Unique Identified (EUI-64). For example,

ACME_Dialysis_Machine^080019FFFE3ED02D^EUI-64

The EUI-64 is created from the MAC Adress of the interface sending the messages. If the MAC address of the interface is 12-34-56-78-AB-CD then the EUI-64 is 123456FFFE78ABCD.

MSH-7 Date/time of message (TS)

HL7 Definition: This field contains the date/time that the sending system created the message. If the time zone is specified, it will be used throughout the message as the default time zone.

MSH-9 Message type (MSG)

HL7 Definition: This element contains the message type, trigger event, and the message structure ID for the message.

CM Components: <message type (ID)> ^ <trigger event (ID)> ^ <message structure (ID)>

The allowed components of this element are listed in several tables maintained by HL7 (*HL7 Table 0076 - Message type*, *HL7 Table 0003 - Event type*, and *HL7 Table 0354 - Message structure*).

This Specification: In the MT-ACK-1 message type, this element shall be hard coded to ACK^R01^ACK

MSH-10 Message control ID (ST)

HL7 Definition: This element contains a number or other identifier that uniquely identifies the message.

This Specification: The sending system shall assign an identifier for the message that is unique within the namespace of the sending facility and/or application.

Note that the value of this element is *not* a reference to the message that is being acknowledged. The Message control ID of the acknowledged message appears in MSA-2 Message Control ID.

Note on Element Length: The element length for MSH-10 has been extended to 50 characters from the HL7-prescribed length of 20 characters. This extension allows sending systems to use globally unique identifiers (such as GUIDs) for Message IDs, an increasingly common practice.

MSH-11 Processing ID (PT)

HL7 Definition: This field is used to decide whether to process the message as defined in HL7 Application (level 7) Processing rules.

This Specification: This value will be "P".

MSH-12 Version ID (VID)

HL7 Definition: This field identifies the version.

This Specification: This value will be "2.6".

MSH-21 Message Profile Identifier (EI)

HL7 Definition: Sites may use this element to assert adherence to a Conformance Statement published by HL7 or by a site. Conformance Statements contain detailed explanations of grammar, syntax, and usage for a particular message or set of messages. This element is treated like all EI data type information, if the underscores or dashes are used as encoding characters in an interface, those characters shall be escaped to be sent in the above element.

This Specification: In the MT-ACK-1 message type, MSH-21 Conformance statement ID should be: DIALY_MT-ACK-1_R1

6.2.3 OBR– Observation Request Segment

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. All observation dates and times reported here should match OBX segments that report the same information.

HL7 Attribute Table - OBR Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	SI	R		Set ID – OBR
2	EI	X		Placer Order Number
3	EI	R		Filler Order Number
4	CWE	R	9999	Universal Service Identifier
5		X		Priority
6		X		Requested Date/Time
7	DTM	R		Observation Date/Time #
8	DTM	X		Observation End Date/Time #
9	CQ	X		Collection Volume *
10	XCN	X		Collector Identifier *
11	ID	X	0065	Specimen Action Code *
12	CWE	X	9999	Danger Code
13	ST	X		Relevant Clinical Information
14		X		Specimen Received Date/Time *
15		X		Specimen Source
16	XCN	X		Ordering Provider
17	XTN	X		Order Callback Phone Number

HL7 Attribute Table - OBR Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
18	ST	X		Placer Field 1
19	ST	X		Placer Field 2
20	ST	X		Filler Field 1 +
21	ST	X		Filler Field 2 +
22	DTM	X		Results Rpt/Status Chng – Date/Time +
23	MOC	X		Charge to Practice +
24	ID	X	0074	Diagnostic Serv Sect ID
25	ID	C	0123	Result Status +
26	PRL	X		Parent Result +
27		X		Quantity/Timing
28	XCN	X		Result Copies To
29	EIP	X		Parent
30	ID	X	0124	Transportation Mode
31	CWE	X	9999	Reason for Study
32	NDL	X		Principal Result Interpreter +
33	NDL	X		Assistant Result Interpreter +
34	NDL	X		Technician +
35	NDL	X		Transcriptionist +
36	DTM	X		Scheduled Date/Time +
37	NM	X		Number of Sample Containers *
38	CWE	X	9999	Transport Logistics of Collected Sample *
39	CWE	X	9999	Collector's Comment *
40	CWE	X	9999	Transport Arrangement Responsibility
41	ID	X	0224	Transport Arranged
42	ID	X	0225	Escort Required
43	CWE	X	9999	Planned Patient Transport Comment
44	CNE	X	0088	Procedure Code
45	CNE	X	0340	Procedure Code Modifier
46	CWE	X	0411	Placer Supplemental Service Information
47	CWE	X	0411	Filler Supplemental Service Information
48	CWE	X	0476	Medically Necessary Duplicate Procedure Reason
49	CWE	X	0507	Result Handling
50	CWE	X		Parent Universal Service Identifier
51	EI	X		Observation Group ID
52	EI	X		Parent Observation Group ID
53	CX	X		Alternate Placer Order Number

OBR-3 Filler Order Number

HL7 Definition: This field is the order number associated with the filling application. This is a permanent identifier for an order and its associated observations.

This specification: This value is used to convey a unique identifier for the therapy being performed. It is a concatenation of the Dialysis Machine EUI-64 (see MSH-3) and a timestamp. The format is

Therapy_ID^Machine_Name^Extended_Unique_Identifier^EUI-64

The Machine Name and Extended Unique identified are the same as conveyed in the MSH-3. The Therapy_ID is the Extended Unique Identifier concatenated with the timestamp using the following format.

XXXXXXXXXXXXXXXXYYYYMMDDhhmmss

Where XXXXXXXXXXXXXXXX is the Extended Unique Identifier

YYYY is the year

MM is the month with zero padding.

DD is the day of the month with zero padding.

hh is the hours (0-23) with zero padding.

mm is the minutes with zero padding

ss is the seconds with zero padding

Example of a Therapy_ID, 080019FFFE3ED02D2011060204584

Example of the OBR-3 Field,
080019FFFE3ED02D20110602045842^ACME_Dialysis_Machine^080019FFFE3ED02D^EUI-64

OBR-4 Universal Service ID

HL7 Definition: This field contains the identifier code for the requested observation/test/battery.

This specification: 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-7 Observation Date/Time

HL7 Definition: This field is the clinically relevant date/time of the observation. In the case of observations taken directly from a subject, it is the actual date and time the observation was obtained. In the case of a specimen associated study, this field shall represent the date and time the specimen was collected or obtained. (This is a results-only field except when the placer or a third party has already drawn the specimen.) This field is conditionally required. When the OBR is transmitted as part of a report message, the field **must** be filled in. If it is transmitted as part of a request **and** a sample has been sent along as part of the request, this field must be filled in because this specimen time is the physiologically relevant date/time of the observation.

This Specification: This value will be the same as the message time, MSH-7.

OBR-25 Result Status

HL7 Definition: This field contains the status of results for this order. This conditional field is required whenever the OBR is contained in a report message. See HL7 Table 0085.

This Specification: This value will always be Final ("F").

6.2.4 OBX– Observation Results Segment

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 to set the context for observations dealing with the dialysis device, characteristics, or treatment measurements.

HL7 Attribute Table - OBX Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	SI	R		Set ID – OBX
2	ID	C	0125	Value Type
3	CWE	R	9999	Observation Identifier
4	ST	R		Observation Sub-ID
5	varies	R		Observation Value
6	CWE	R	9999	Units
7	ST	CE		References Range
8	CWE	X		Interpretation Codes
9	NM	X		Probability
10	ID	X	0080	Nature of Abnormal Test
11	ID	R	0085	Observation Result Status
12	DTM	X		Effective Date of Reference Range
13	ST	X		User Defined Access Checks
14	DTM	CE		Date/Time of the Observation
15	CWE	X	9999	Producer's ID
16	XCN	X		Responsible Observer
17	CWE	X	9999	Observation Method
18	EI	X		Equipment Instance Identifier
19	DTM	X		Date/Time of the Analysis
20	CWE	X	0163	Observation Site
21	EI	X		Observation Instance Identifier
22	CNE	X	0725	Mood Code
23	XON	X		Performing Organization Name
24	XAD	X		Performing Organization Address
25	XCN	X		Performing Organization Medical Director
26	ID	X	0909	Patient Results Release Category

OBX-1 Set ID

HL7 Specification: This field contains the sequence number.

OBX-2 Value Type

HL7 Specification: This field defines the data type of OBX-5, Observation Value.

This specification: Only value identified in the table below will be used. The value is based upon the value type as identified in the Dialysis Data Elements Table.

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

OBX-3 Observation Identifier

HL7 Specification: This field contains a unique identifier for the observation.

This specification: The format is that of the Coded Element (CWE). Example: "158606^MDC_HDIALY_DIALYSATE_FLOW_MODE^MDC".

OBX-4 Observation Sub-ID

HL7 Specification: This field is used to distinguish between multiple OBX segments with the same observation ID organized under one OBR.

This specification: This value is expressed in a dotted notation consisting of 4 parts, MDS, VMD, CHAN, and Parameter.

OBX-5 Observation Value

HL7 Specification: This field contains the value observed by the observation producer.

This specification: This is the actual value is expressed a string value.

OBX-6 Unit

HL7 Specification: This field contains the units of measurement for the value.

This specification: Will be coded with the MDC_IDC Nomenclature (based on UCUM) Unit for associated observation. Example, "ml/min^milliliter per minute^UCUM"

OBX-7 Reference Range

HL7 Specification: Reference range for the value.

a) lower limit-upper limit (when both lower and upper limits are defined, e.g., for Venous Pressure, 20-400)

b) > lower limit (if no upper limit, e.g., >10)

c) < upper limit (if no lower limit, e.g., <15)

This specification: For Dialysis Machines' this field is used to provide the alarm limits for a numeric parameter.

OBX-8 Interpretation Codes

HL7 Specification: One or more codes specifying a categorical assessment of the observation value (OBX-5), such as "Normal", "Abnormal", "Positive", "Negative", "Resistant", "Susceptible", etc.

This specification: This field is used to provide zero or more codes separated by the tilde ("~"). A dialysis machine provides two mandatory codes, Alarm priority and Alarm Type, and one optional code, Abnormality Type.

The alarm priority is dialysis machine specific and may vary by manufacturer.

Alarm Priority	Code
High	PH
Medium	PM
Low	PL
Informational	PI
Priority Not Indicated	PN
Priority Unknown	PU

The Alarm Type is specific in the Alert Type Column in the Dialysate Data Elements Table.

Alarm Type	Code
Phsysiological	SP
Technical	ST
Advisory	SA

Abnormality Type	Code
Below low normal	L
Above high normal	H

OBX-11 Observation Result Status

HL7 Specification: This field contains the observation result status, *HL7 Table 0085.*

This specification: This field will always be Final ("F").

OBX-14 Date/Time of Observation

HL7 Specification: This field is required in two circumstances. The first is when the observations reported beneath one report header (OBR) have different dates/times. This could occur in the case of queries, timed test sequences, or clearance studies where one measurement within a battery may have a different time than another measurement.

This specification: Dialysis Machines' use this field to report the time and date of spot check values such as non-invasive blood pressure.

6.2.5 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.

HL7 Attribute Table - PID Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	SI	R		Set ID - PID
2		X		Patient ID
3	CX	R		Patient Identifier List
4		X		Alternate Patient ID - PID
5	XPN	R	0200	Patient Name
6	XPN	X		Mother's Maiden Name
7	DTM	X		Date/Time of Birth
8	CWE	X	0001	Administrative Sex
9		X		Patient Alias
10	CWE	X	0005	Race
11	XAD	X		Patient Address
12		X		County Code
13	XTN	X		Phone Number - Home
14	XTN	X		Phone Number - Business
15	CWE	X	0296	Primary Language
16	CWE	X	0002	Marital Status
17	CWE	X	0006	Religion
18	CX	X	0061	Patient Account Number
19		X		SSN Number - Patient
20		X		Driver's License Number - Patient
21	CX	X	0061	Mother's Identifier
22	CWE	X	0189	Ethnic Group
23	ST	X		Birth Place
24	ID	X	0136	Multiple Birth Indicator
25	NM	X		Birth Order

HL7 Attribute Table - PID Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
26	CWE	X	0171	Citizenship
27	CWE	X	0172	Veterans Military Status
28		X		Nationality
29	DTM	X		Patient Death Date and Time
30	ID	X	0136	Patient Death Indicator
31	ID	X	0136	Identity Unknown Indicator
32	CWE	X	0445	Identity Reliability Code
33	DTM	X		Last Update Date/Time
34	HD	X		Last Update Facility
35	CWE	X	0446	Species Code
36	CWE	X	0447	Breed Code
37	ST	X		Strain
38	CWE	X	0429	Production Class Code
39	CWE	X	0171	Tribal Citizenship
40	XTN	X		Patient Telecommunication Information

PID-3.1 Patient Identifier List

ID Number contains a unique identifier for the patient assigned by the Device or entered by the User. 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 Dialysis Machine with an identifier type code of U (see table following). This will be used by the DOC to match the device reports with the patient accounts.

HL7 Table 0203

Code	Description	Notes	Use
U	Model and Serial Number of Device MDC_ID_MODEL_NUMBER and MDC_ID_PROD_SPEC_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

6.2.6 PV1 – Patient Visit Segment

The PV1 segment is used by Registration/Patient Administration applications to communicate information on an account or visit-specific basis. Because it is required in the PCD-01 Message, it is included in this standard. The Dialysis Machine Provides the bare minimum of data to be compliant.

HL7 Attribute Table - PV1 Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	SI	R		Set ID - PV1
2	CWE	R	0004	Patient Class
3	PL	O		Assigned Patient Location
4	CWE	X	0007	Admission Type
5	CX	X		Preadmit Number

HL7 Attribute Table - PV1 Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
6	PL	X		Prior Patient Location
7	XCN	X	0010	Attending Doctor
8	XCN	X	0010	Referring Doctor
9	XCN	X		Consulting Doctor
10	CWE	X	0069	Hospital Service
11	PL	X		Temporary Location
12	CWE	X	0087	Preadmit Test Indicator
13	CWE	X	0092	Re-admission Indicator
14	CWE	X	0023	Admit Source
15	CWE	X	0009	Ambulatory Status
16	CWE	X	0099	VIP Indicator
17	XCN	X	0010	Admitting Doctor
18	CWE	X	0018	Patient Type
19	CX	RE		Visit Number
20	FC	X	0064	Financial Class
21	CWE	X	0032	Charge Price Indicator
22	CWE	X	0045	Courtesy Code
23	CWE	X	0046	Credit Rating
24	CWE	X	0044	Contract Code
25	DT	X		Contract Effective Date
26	NM	X		Contract Amount
27	NM	X		Contract Period
28	CWE	X	0073	Interest Code
29	CWE	X	0110	Transfer to Bad Debt Code
30	DT	X		Transfer to Bad Debt Date
31	CWE	X	0021	Bad Debt Agency Code
32	NM	X		Bad Debt Transfer Amount
33	NM	X		Bad Debt Recovery Amount
34	CWE	X	0111	Delete Account Indicator
35	DT	X		Delete Account Date
36	CWE	X	0112	Discharge Disposition
37	DLD	X	0113	Discharged to Location
38	CWE	X	0114	Diet Type
39	CWE	X	0115	Servicing Facility
40		X		Bed Status
41	CWE	X	0117	Account Status
42	PL	X		Pending Location
43	PL	X		Prior Temporary Location
44	DTM	X		Admit Date/Time
45	DTM	X		Discharge Date/Time
46	NM	X		Current Patient Balance
47	NM	X		Total Charges
48	NM	X		Total Adjustments
49	NM	X		Total Payments
50	CX	X	0203	Alternate Visit ID
51	CWE	X	0326	Visit Indicator
52		X		Other Healthcare Provider
53	ST	X		Service Episode Description
54	CX	X		Service Episode Identifier

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PV1-2 Patient Class (CWE)

HL7 Definition: This field is used by systems to categorize patients by site. See HL7 Table 0004.

This specification: Dialysis machines will always use the Unknown Patient Class.

PV1-2 Patient Class (PL)

HL7 Definition: This field contains the patient's initial assigned location or the location to which the patient is being moved.

This specification: This field contains the patient's current location.

The fields of the Person Location (PL) data type are complex and the reader is referred to the HL7 Chapter on Data Types. Several examples from that chapter are shown below.

Example: Nursing Unit

A nursing unit at Community Hospital: 4 East, room 136, bed B

```
4E^136^B^CommunityHospital^^N^^^
```

Example: Clinic

A clinic at University Hospitals: Internal Medicine Clinic located in the Briones building, 3rd floor.

```
InternalMedicine^^^UniversityHospitals^^C^Briones^3^
```

Example: Home

The patient was treated at his home.

```
^^^^^H^^^
```

PV1-19 Visit Number (CX)

HL7 Definition: This field contains the unique number assigned to each patient visit.

This specification: This field will be empty.

7 Dialysis Data Elements

7.1 Tables

This section defines tables of values used by the message elements.

_TBL_01 – Mode of Operation

Value	Description
PRETX	Pre-Treatment - Preparing for dialysis but no blood in extracorporeal circuit
TX	Treatment - Blood in the extracorporeal circuit
POSTTX	Post-Treatment - After dialysis but no longer any blood in extracorporeal circuit
DIS	Disinfection or rinse of dialysis fluid path.
IDL	Idle
SVC	Service mode

_TBL_02 – Treatment Modality

Value	Description
HD	Hemodialysis – dialysis with diffusive transport of solutes.
HDF	Hemodiafiltration – dialysis with both diffusive and convective transport of solutes
HF	Hemofiltration – dialysis with convective transport of solutes.
SLED	Sustained low efficiency dialysis.
IUF	Isolated Ultrafiltration - Removal of plasma water without dialysis
HP	Hemoperfusion – Removal of solutes from blood by adsorption.

_TBL_03 – Anticoagulation Mode

Value	Description
BOL	Bolus - Administration of a fixed amount of anticoagulant drug during a specific time
CON	Continuous - Anticoagulant drug administered at a constant rate
BOLCON	Combination of Bolus and Continuous mode
PRO	Profile - Anticoagulant drug administered at a variable rate according to a programmed profile
BOLPRO	Combination of Bolus and Profile mode
NONE	None

_TBL_04 – Patient Position

Value	Description
SITTING	Sitting
STANDING	Standing
SUPINE	Supine

_TBL_05 – Blood Pump Mode

Value	Description
2N	Double Needle - Separate needles/catheter lumens for arterial and venous blood flow
1N1P	Single Needle/Single Pump - The same needle/catheter lumen used for both arterial and venous blood flow, blood flow controlled by one pump

_TBL_05 – Blood Pump Mode

Value	Description
1N2P	Single Needle/Double Pump - The same needle/catheter lumen used for both arterial and venous blood flow, blood flow controlled by two pumps

_TBL_06 – Dialysis Flow Mode

Value	Description
CONST	Constant dialysis fluid flow
AUTO	Auto - Dialysis fluid flow is automatically controlled by the dialysis machine
PRO	Profile - Variable dialysis fluid flow according to a programmed profile
STBY	Standby - dialysis fluid flow is reduced when dialysis machine is not providing treatment
NONE	Dialysis fluid does not flow.

_TBL_07 – Replacement Fluid Delivery Mode

Value	Description
CONST	Constant replacement fluid flow
PRO	Profile - Variable replacement fluid flow according to a programmed profile
NONE	None, Not Applicable.
BOLUS	Bolus - administration of a fixed amount of replacement fluid during a specific time
AUTO	Automatic - Replacement fluid flow is automatically controlled by the dialysis machine

_TBL_08 – RF Dilution Location

Value	Description
PREF	Pre-Filter
POSTF	Post-Filter
PREF-POSTF	Both Pre-Filter and Post-Filter
PREP-POSTF	Both Pre-Pump and Post-Filter

_TBL_09 – Fluid Source

Value	Description
BAG	Bag – Replacement fluid
ONLINE	Online - Replacement fluid prepared by dialysis machine

_TBL_10 – Plasma Volume Marker

Value	Description
NONE	None – No selection made at time of reading/reporting
SYMP	Symptomatic – Noting a symptom for continue monitoring.
INTER	Intervention – Action was taken or a machine setting was changed

_TBL_11 – Plasma Volume Profile

Value	Description
FLAT	Change less than or equal to 3% per hour
GRAD	Change greater than 3% and less than or equal to 6.5% per hour
STEEP	Change greater than 6.5% per hour

_TBL_12 – Completion Method

Value	Description
CT	Clock Time
AT	Actual Treatment Time
UF	UF Removed
KTV	Kt/V
USER	The treatment runs until stopped by the user.

_TBL_13 – Ultrafiltration Mode

Value	Description
NONE	None
CONST-WT	UF removed at a constant rate with a target volume
PRO-WT	UF removed according to a programmed profile with a Target Volume
CONST-WOT	UF removal at a constant rate without a target Volume
PRO-WOT	UF removed according to programmed profile without a target volume.

_TBL_14 – Bicarb Delivery Mode

Value	Description
CONST	Constant – Bicarbonate concentration in dialysis fluid is constant.
PRO	Profile - Bicarbonate concentration in dialysis fluid is adjusted according to a programmed profile
NA	Not Applicable

_TBL_15 – Sodium Delivery Mode

Value	Description
CONST	Constant - Sodium concentration in dialysis fluid is constant
PRO	Profile - Sodium concentration in dialysis fluid is adjusted according to a programmed profile

7.2 Private Data Objects

The Common Data Objects defined in the next section were created to support a wide range of dialysis machines and therapies. Although, the number of objects is large it is not exhaustive. If there is a need to capture an object that is not defined, 11073 Private Terms may be used. 11073 Terms consists of a Partition and Term Code. The Term is equal to Partition*2^{16} + Term Code. Private Terms are Terms whose Term Codes are in the range of 0xF000 to 0xFFFF. For Dialysis Machine Private Terms, these values are in the range of 2:0xF000 and 2:0xFFFF. For example, a manufacturer that needed to define a term for a Blood Warmer Settings could use the following:

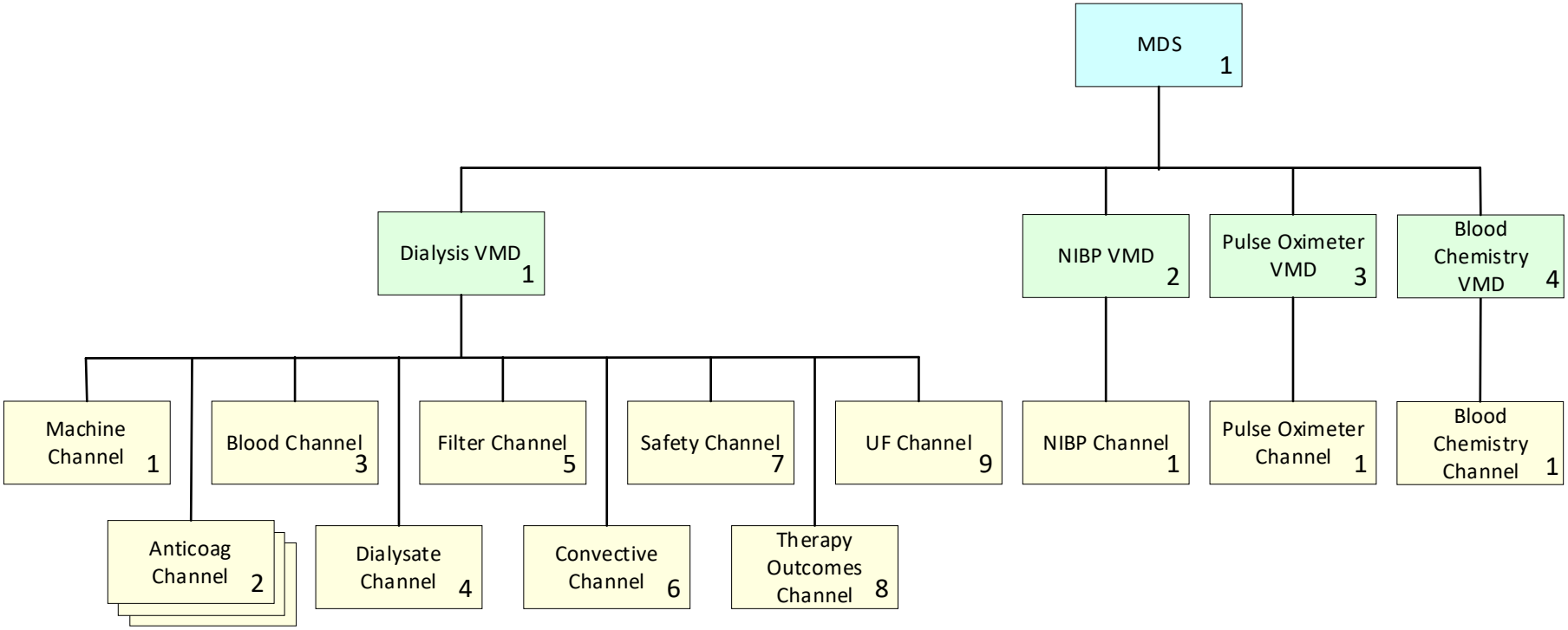
192548^MDCACME_BLOOD_TEMP_SETTING^MDC

The value 129548 is partition 2 and item 0xF024.

Text based REFID should be descriptive and unique enough to allow the manufacturer to be identified. For example, "MDCACME".

It is the responsibility of the manufacturer to disclose the meaning of any private terms that they report if they are needed by an external entity.

7.3 Common Data Objects



In the table below when usage is conditional (C), a number is given. The number refers to one of the following conditions. if the condition is not met then the cardinality is "0..0".

1) If Anticoagulation Mode is not None
2) If Anticoagulation Mode includes Bolus
3) If Anticoagulation Mode includes Continuous or Profile
4) One for each anticoagulant pump
5) If Blood Pump Mode is not double needle
6) If Mode is HD or HDF
7) If Mode is HF or HDF and Dilution is Post or Pre-Post
8) If Mode is HDF or HF
9) If Replacement Fluid Mode is Bolus
10) If Completion Method is not None
11) if UF removal includes a target volume
12) If Mode is HD or HDF and the dialysis machine knows the conductivity through direct measurement or by knowing what type of bagged fluid is being used.

Any object below that is a cumulative total is the total since the start of treatment and not since the start of the filter.

Table 1 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Obser-vation Sub ID	Phase	Message	Temp-oral	Data Type	Format	UCUM UOM	CARD	USE
MDC_DEV_HDIALY_MACHINE_MDS (70929)					**1**							**1..1**	
MDC_ATTR_ID_MODEL (67880)		**Dialysis Device**	Dialysis Device Model and Manufacturer	String containing device model and manufacturer's name	1.0.0.1	All	Identifier	All	String	Alphanumeric	N/A	1..1	M
MDC_ID_MODEL_MANUFACTURER (531970)		**Dialysis Device**	Dialysis Device Manufacturer	String containing device manufacturer's name (or use MDC_ATTR_ID_MODEL)	1.0.0.2	All	Identifier	All	String	Alphanumeric	N/A	1..1	M
MDC_ID_MODEL_NUMBER (531969)		**Dialysis Device**	Dialysis Device Model	String containing device manufacturer's model identifier for the device (or use MDC_ATTR_ID_MODEL)	1.0.0.3	All	Identifier	All	String	Alphanumeric	N/A	1..1	M
MDC_ID_PROD_SPEC_SERIAL (531972)		**Dialysis Device**	Dialysis Device Serial Number	String containing the device's serial number	1.0.0.4	All	Identifier	All	String	Alphanumeric	N/A	1..1	M
MDC_ID_PROD_SPEC_SW (531975)		**Dialysis Device**	Device Software Version	String defining the version of the software on the machine	1.0.0.5	All	Identifier	All	String	Alphanumeric	N/A	1..1	M
PRT-10 PRT-16-20 MDC_ATTR_ID_UDI (67916)		**Dialysis Device**	Dialysis Device UDI	String containing the device's FDA required Universal Device Identifier [Note: MDC_ATTR_ID_UDI contains three components: UdiAuthority, UdiIssuer, UdiLabel to support non-FDA entities, but currently there is no approved way of encoding this using HL7 V2; PRT-10 and PRT-16-20 is used instead; UdiLabel = PRT-10.]	1.0.0.6	All	Identifier	All	String	Alphanumeric	N/A	1..1	O
MDC_DEV_HDIALY_VMD (70934)					**1.1**							**1..1**	**M**
MDC_DEV_HDIALY_MACH_CONFIG_CHAN (70939)					**1.1.1**							**1..1**	**M**
MDC_HDIALY_MACH_TIME (158592)		**Dialysis Device**	Dialysis Device Time	Date and time as recorded on the dialysis device's internal clock with offset to UTC (based on location and DST)	1.1.1.1	All	Identifier	All	Time	YYYYMMDDHHMMSS[.SSS]+/-ZZZZ	N/A	1..1	M
MDC_HDIALY_MACH_MODE_DESCRIPTION (158593)		**Dialysis Device**	Machine Mode Description	Manufacturer-specific description of the machine mode of operation	1.1.1.2	All	Parameter	Episodic	String	Alphanumeric	N/A	0..1	O
MDC_HDIALY_MACH_MODE_OF_OPERATION (158594)		**Dialysis Device**	Machine Mode Of Operation	Process the machine is currently performing	1.1.1.3	All	Parameter	Episodic	_TBL_01	Alphanumeric	N/A	1..1	M
MDC_TIME_PD_MAINTENANCE_TO_NEXT_SERVICE (184195)		**Dialysis Device**	Preventive Maintenance Time Remaining	Hours of operation remaining until next preventative maintenance is required	1.1.1.4	All	Status	Episodic	Numeric	XXXX	h	0..1	O

Table 1 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Observation Sub ID	Phase	Message	Temporal	Data Type	Format	UCUM UOM	CARD	USE
MDC_ MAINTENANCE_NEXT_SERVICE_DATE (184199)		**Dialysis Device**	Preventative Maintenance Due Date	The date on which preventative maintenance is due.	1.1.1.5	All	State	Episodic	Date	YYYYMMDD	N/A	0..1	O
MDC_HDIALY_MACH_MAINT_TX_REMAIN (158595)		**Dialysis Device**	Preventive Maintenance Treatments Remaining	Number of treatments remaining until next preventative maintenance is required	1.1.1.6	All	Status	Episodic	Numeric	XXXX	N/A	0..1	O
MDC_HDIALY_MACH_BLD_PUMP_ON (158596)		**Dialysis Device**	Treatment Blood Pump On	Status indicating if blood pump is running	1.1.1.7	Intradialytic	Parameter	Episodic	Bool	T / F	N/A	1..1	M
MDC_HDIALY_MACH_TX_FLUID_BYPASS (158597)		**Dialysis Device**	Treatment Fluid Bypass	Fluid pathway state to indicate if fluid is NOT flowing through dialyzer	1.1.1.8	Intradialytic	Parameter	Episodic	Bool	T / F	N/A	1..1	M
MDC_HDIALY_MACH_TX_MODALITY (158598)		**Dialysis Device**	Treatment Modality	The way a patient receives dialysis	1.1.1.9	All	Parameter	Episodic	_TBL_02	Alphanumeric	N/A	1..1	M
MDC_HDIALY_MACH_THERAPY_TIME (158720)		**Dialysis Device State**	Elapsed Treatment Time	Accumulated time that the patient has been actively treated. This does not include time spend in alarms, recirculating or rinsing back.	1.1.1.10	Intradialytic	Status	Periodic	Numeric	XXXX	min	1..1	M
MDC_HDIALY_MACH_TIME_REMAIN (158724)		**Dialysis Device State**	Remaining Treatment Time	Number of minutes left for current dialysis session	1.1.1.11	Intradialytic	Status	Periodic	Numeric	XXXX	min	1..1	C10
MDC_TEMP_ROOM (188508)		**Dialysis Device State**	Room Temperature	Room Temperature in which the Dialysis Machine is operating	1.1.1.12	All	Status	Periodic	Numeric	XX.X	Cel	0..1	O
MDC_DEV_HDIALY_ANTICOAG_PUMP_CHAN (70943)					**1.1.2**							**1..***	**C1**
MDC_HDIALY_ANTICOAG_ACCUM_DELIV (158728)		**Anticoagulant Pump**	Accumulated Delivered Anticoagulant	Total amount of anticoagulation drug administered to patient since the start of treatment	1.1.2.1	Intradialytic	Status	Both	Numeric	XXX.X	mL	0..1	C1
MDC_HDIALY_ANTICOAG_BOLUS_VOL (158732)		**Anticoagulant Pump**	Anticoagulant Bolus Volume	User defined amount of anticoagulation drug to be administered in this single large dose	1.1.2.2	Intradialytic	Parameter	Episodic	Numeric	XX.X	mL	0..1	C2
MDC_HDIALY_ANTICOAG_INFUS_RATE (158736)		**Anticoagulant Pump**	Anticoagulant Infusion Rate	User defined amount of anticoagulation drug to be administered per unit time	1.1.2.3	Intradialytic	Parameter	Episodic	Numeric	XX.X	mL/h	0..1	C3
MDC_EVT_HDIALY_ANTICOAG_STOP (198236)	tech	**Anticoagulant Pump**	Anticoagulant Pump Stop	Notification that the anticoagulant pump has stopped	1.1.2.4	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O
MDC_HDIALY_ANTICOAG_NAME (158599)		**Anticoagulant Pump**	Anticoagulant Type	Name of the anticoagulant	1.1.2.5	Intradialytic	Parameter	Episodic	String	Alphanumeric	N/A	0..1	O
MDC_HDIALY_ANTICOAG_MODE (158600)		**Anticoagulant Pump**	Anticoagulation Mode	Method of anticoagulant administration during dialysis treatment	1.1.2.6	Intradialytic	Parameter	Episodic	_TBL_03	Alphanumeric	N/A	1..1	C4

Table 1 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Observation Sub ID	Phase	Message	Temporal	Data Type	Format	UCUM UOM	CARD	USE
MDC_ATTR_CHAN_NUM_LOGICAL (68142)		**Anticoagulant Pump**	Anticoagulant Pump Number	The number associated with the anticoagulant pump in this channel. The value starts at 1 and is incremented for each anticoagulant pump in use.	1.1.2.7	Intradialytic	Parameter	Episodic	Numeric	X	N/A	1..1	M
MDC_EVT_HDIALY_ANTICOAG_SYRINGE_EMPTY (198238)	tech	**Anticoagulant Pump**	Syringe Empty	Notification that the syringe plunger has reached the end of its functional range	1.1.2.8	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O
MDC_HDIALY_ANTICOAG_SYRINGE_BRAND (158602)		**Anticoagulant Pump**	Syringe Name	Name of the syringe	1.1.2.9	Intradialytic	Parameter	Episodic	String	Alphanumeric	N/A	0..1	O
MDC_HDIALY_ANTICOAG_SYRINGE_VOL (158603)		**Anticoagulant Pump**	Syringe Volume	Volume of the syringe with anticoagulant.	1.1.2.10	Intradialytic	Parameter	Episodic	Numeric	XXX	mL	0..1	O
MDC_EVT_HDIALY_ANTICOAG_SYRINGE_SIZE (198240)	tech	**Anticoagulant Pump**	Wrong Syringe Size	Notification that the size of the syringe is not the size defined for anticoagulant administration	1.1.2.11	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O
MDC_DEV_HDIALY_BLOOD_PUMP_CHAN (70947)					**1.1.3**							**1..1**	**M**
MDC_HDIALY_BLD_PUMP_BLOOD_FLOW_RATE (158740)		**Blood Pump**	Actual Blood Flow Rate	Adjusted blood flow rate based on the blood flow rate setting and pressure drop caused by blood line, needle and vascular access	1.1.3.1	Intradialytic	Status	Periodic	numeric	XXX	mL/min	0..1	O
MDC_HDIALY_BLD_PUMP_BLOOD_FLOW_RATE_SETTING (16935956)		**Blood Pump**	Blood Flow Rate Setting	The rate at which the user programmed the blood flow	1.1.3.2	Intradialytic	Parameter	Episodic	Numeric	XXX	mL/min	1..1	M
MDC_HDIALY_BLD_PUMP_BLOOD_FLOW_RATE_MEAN (158743)		**Blood Pump**	Average Blood Flow Rate	Average of the actual blood flow rate over the course of treatment.	1.1.3.3	Intradialytic	Status	Periodic	Numeric	XXX	mL/min	0..1	O
MDC_HDIALY_BLD_PRESS_ART (158744)	phys tech high low thr	**Blood Pump**	Arterial Pressure	Pressure of arterial access line pre blood pump	1.1.3.4	Intradialytic	Status	Periodic	Numeric	±XXX	mm[Hg]	1..1	M
MDC_HDIALY_BLD_PUMP_MODE (158604)		**Blood Pump**	Blood Pump Mode	Therapy method in which blood is retrieved and returned to the patient.	1.1.3.5	Intradialytic	Parameter	Episodic	_TBL_05	Alphanumeric	N/A	1..1	M
MDC_EVT_HDIALY_BLD_PUMP_STOP (198242)	tech	**Blood Pump**	Blood Pump Stop	Notification that the blood pump has stopped	1.1.3.6	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	M
MDC_HDIALY_BLD_PUMP_TUBING_SIZE (158605)		**Blood Pump**	Blood Tubing Size	Inner diameter of pump segment of tubing used in extracorporeal circulation	1.1.3.7	Intradialytic	Parameter	Episodic	String	alphanumeric	N/A	0..1	O
MDC_HDIALY_BLOOD_TEMP_ART (158748)		**Blood Pump**	Arterial Blood Temperature	Arterial blood temperature as measured by the device.	1.1.3.8	Intradialytic	Status	Periodic	Numeric	XX.X	Cel	0..1	O

Table 1 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Observation Sub ID	Phase	Message	Temporal	Data Type	Format	UCUM UOM	CARD	USE
MDC_HDIALY_BLD_PUMP_CHANGE_IN_ENERGY (158752)		**Blood Pump**	Change In Energy	Measurement of the energy (temperate) flux to and from the patient	1.1.3.9	Intradialytic	Status	Periodic	Numeric	±XXX.X	kJ/h	0..1	O
MDC_HDIALY_BLD_PUMP_PRESS_ART_POST_PUMP (158756)	tech high low thr	**Blood Pump**	Post Pump Arterial Pressure	Pressure of arterial access line post blood pump	1.1.3.10	Intradialytic	Status	Periodic	Numeric	±XXX	mm[Hg]	0..1	O
MDC_HDIALY_BLD_PUMP_PRIMING_VOL (158760)		**Blood Pump**	Priming Volume	Volume of fluid used to prime the extracorporeal circuit	1.1.3.11	Intradialytic	Parameter	Episodic	Numeric	XXX	mL	0..1	O
MDC_HDIALY_BLD_PUMP_SINGLE_NEEDLE_PRESS (158764)	tech high low thr	**Blood Pump**	Single Needle Switching Pressure	In single needle mode, the pressure used to switch phases at high pressure	1.1.3.12	Intradialytic	Parameter	Episodic	Numeric	± XXX	mm[Hg]	0..1	O
MDC_HDIALY_BLD_PUMP_STROKE_VOL (158768)		**Blood Pump**	Stroke Volume	The volume of blood passing through the dialyzer during each single needle cycle.	1.1.3.13	Intradialytic	Status	Periodic	Numeric	XXX	mL	0..1	C5
MDC_HDIALY_BLD_PUMP_BLOOD_PROCESSED_TOTAL (158772)		**Blood Pump**	Total Blood Processed	Accumulated volume of blood circulated by extracorporeal circulation.	1.1.3.14	Intradialytic	Status	Periodic	Numeric	XXXX.XX	L	0..1	O
MDC_HDIALY_BLD_PUMP_PRESS_VEN (158776)	phys tech high low thr	**Blood Pump**	Venous Pressure	Pressure of the venous access line	1.1.3.15	Intradialytic	Status	Periodic	Numeric	±XXX	mm[Hg]	1..1	M
MDC_HDIALY_BLOOD_TEMP_VEN (158780)		**Blood Pump**	Venous Temperature	Temperature of the blood measured in the venous access line	1.1.3.16	Intradialytic	Status	Periodic	Numeric	XX.X	Cel	0..1	O
MDC_HDIALY_BLOOD_TEMP_VEN_SETTING (16935996)		**Blood Pump**	Venous Temperature Setting	Desired temperature of the blood in the venous access line	1.1.3.17	Intradialytic	Status	Periodic	Numeric	XX.X	Cel	0..1	O
MDC_DEV_HDIALY_FLUID_CHAN (70951)					**1.1.4**							**1..1**	**C6**
MDC_HDIALY_BICARB_COND (158784)		**Dialysis Fluid**	Actual Bicarbonate Conductivity	Measured conductivity of bicarbonate	1.1.4.1	Intradialytic	Status	Periodic	Numeric	XX.XX	mS/cm	0..1	O
MDC_HDIALY_BICARB_COND_SETTING (16936000)		**Dialysis Fluid**	Bicarbonate Conductivity Setting	Bicarbonate conductivity	1.1.4.2	Intradialytic	Parameter	Episodic	Numeric	XX.XX	mS/cm	0..1	O
MDC_HDIALY_DIALYSATE_COND (158788)	tech high low	**Dialysis Fluid**	Actual Conductivity	Measured conductivity of dialysate	1.1.4.3	Intradialytic	Status	Periodic	Numeric	XX.XX	mS/cm	1..1	C12
MDC_HDIALY_DIALYSATE_COND_SETTING (16936004)		**Dialysis Fluid**	Dialysate Conductivity Setting	Acid and Bicarbonate conductivity combined	1.1.4.4	Intradialytic	Parameter	Episodic	Numeric	XX.XX	mS/cm	0..1	O
MDC_HDIALY_DIALYSATE_FLOW_RATE (158792)	tech low	**Dialysis Fluid**	Actual Dialysate Flow Rate	Rate of dialysate flow at any given point during a treatment	1.1.4.5	Intradialytic	Status	Periodic	Numeric	XXXX	mL/min	1..1	C6
MDC_HDIALY_DIALYSATE_FLOW_RATE_SETTING (16936008)		**Dialysis Fluid**	Dialysate Flow Rate Setting	Rate at which the user programmed the dialysate flow	1.1.4.6	Intradialytic	Parameter	Episodic	Numeric	XXXX	mL/min	0..1	C6

Table 1 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Obser-vation Sub ID	Phase	Message	Temp-oral	Data Type	Format	UCUM UOM	CARD	USE
MDC_HDIALY_DIALYSATE_FLOW_MODE (158606)		**Dialysis Fluid**	Dialysate Flow Mode	The mode of controlling dialysate flow rate	1.1.4.7	All	Parameter	Episodic	_TBL_06	alphanumeric	N/A	1..1	C6
MDC_HDIALY_DIALYSATE_TEMP (158796)	tech high low	**Dialysis Fluid**	Actual Dialysate Temperature	Temperature of dialysate	1.1.4.8	Intradialytic	Status	Periodic	Numeric	XX.X	Cel	1..1	O
MDC_HDIALY_DIALYSATE_TEMP_SETTING (16936012)		**Dialysis Fluid**	Dialysate Temperature Setting	Temperature at which dialysate is to be delivered to patient	1.1.4.9	Intradialytic	Parameter	Episodic	Numeric	XX.X	Cel	1..1	O
MDC_HDIALY_DIALYSATE_AMMONIA (158800)		**Dialysis Fluid**	Ammonia Concentration	Measured ammonia concentration of the dialysate	1.1.4.10	Intradialytic	Status	Periodic	Numeric	XX.XX	[ppm]	0..1	O
MDC_HDIALY_DIALYSATE_FLOW_RATE_MEAN (158795)		**Dialysis Fluid**	Average Dialysate Flow Rate	Average rate of dialysate flow during course of treatment	1.1.4.11	Intradialytic	Status	Periodic	Numeric	XXXX	mL/min	0..1	O
MDC_HDIALY_CONC_HCO3_SETTING (16936020)		**Dialysis Fluid**	Bicarbonate Concentration Setting	User programmed Bicarbonate concentration in dialysate.	1.1.4.13	Intradialytic	Parameter	Episodic	Numeric	XXX.X	mmol/L	1..1	O
MDC_HDIALY_CONC_HCO3_MODE (158607)		**Dialysis Fluid**	Bicarbonate Mode	Process for delivering adjusted bicarbonate concentration in dialysate	1.1.4.14	Intradialytic	Parameter	Episodic	_TBL_14	Alphanumeric	N/A	1..1	O
MDC_EVT_HDIALY_BLOOD_LEAK (198244)	tech	**Dialysis Fluid**	Blood Leak	Notification that blood has been detected in the dialysate fluid	1.1.4.15	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	M
MDC_HDIALY_DIALYSATE_NAME (158608)		**Dialysis Fluid**	Dialysate Name	String containing a descriptive name of the dialysate	1.1.4.16	Intradialytic	Parameter	Episodic	String	Alphanumeric	N/A	1..1	O
MDC_HDIALY_DIALYSATE_CONC_ACETATE (158808)		**Dialysis Fluid**	Dialysate Acetate Concentration	Acetate concentration in dialysate	1.1.4.17	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O
MDC_HDIALY_DIALYSATE_CONC_HCO3 (158812)		**Dialysis Fluid**	Dialysate Bicarbonate Concentration	Bicarbonate concentration in dialysate	1.1.4.18	Intradialytic	Parameter	Episodic	Numeric	XXX.X	mmol/L	0..1	O
MDC_HDIALY_DIALYSATE_CONC_CHLORIDE (158816)		**Dialysis Fluid**	Dialysate Chloride Concentration	Chloride concentration in dialysate	1.1.4.19	Intradialytic	Parameter	Episodic	Numeric	XXX	mmol/L	0..1	O
MDC_HDIALY_DIALYSATE_CONC_MG (158820)		**Dialysis Fluid**	Dialysate Magnesium Concentration	Magnesium concentration in dialysate	1.1.4.20	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O
MDC_HDIALY_DIALYSATE_CONC_CA (158824)		**Dialysis Fluid**	Dialysate Calcium Concentration	Calcium concentration in dialysate	1.1.4.21	Intradialytic	Parameter	Episodic	Numeric	X.XX	mmol/L	0..1	O
MDC_HDIALY_DIALYSATE_CONC_CITRATE (158828)		**Dialysis Fluid**	Dialysate Citrate Concentration	Citrate concentration in dialysate	1.1.4.22	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O
MDC_HDIALY_DIALYSATE_CONC_GLU (158832)		**Dialysis Fluid**	Dialysate Glucose Concentration	Glucose concentration in dialysate	1.1.4.23	Intradialytic	Parameter	Episodic	Numeric	XXX	mmol/L	0..1	O
MDC_HDIALY_DIALYSATE_CONC_K (158836)		**Dialysis Fluid**	Dialysate Potassium Concentration	Potassium concentration in dialysate	1.1.4.24	Intradialytic	Parameter	Episodic	Numeric	X.X	mmol/L	0..1	O

Table 1 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Observation Sub ID	Phase	Message	Temporal	Data Type	Format	UCUM UOM	CARD	USE
MDC_HDIALY_DIALYSATE_CONC_NA (158840)		**Dialysis Fluid**	Dialysate Sodium Concentration	Sodium concentration in dialysate	1.1.4.25	Intradialytic	Parameter	Episodic	Numeric	XXXX	mmol/L	0..1	O
MDC_HDIALY_DIALYSATE_CONC_NA_SETTING (16936056)		**Dialysis Fluid**	Dialysate Sodium concentration Setting	User programmed sodium concentration in dialysate	1.1.4.26	Intradialytic	Parameter	Episodic	Numeric	XXXX	mmol/L	1..1	O
MDC_HDIALY_DIALYSATE_CONC_NA_MODE (158609)		**Dialysis Fluid**	Dialysate Sodium Mode	Process for delivering adjusted sodium concentration in dialysate	1.1.4.27	Intradialytic	Parameter	Episodic	_TBL_15	Alphanumeric	N/A	1..1	O
MDC_HDIALY_DIALYSATE_CONC_PH (158844)		**Dialysis Fluid**	pH	Measured pH of the dialysate	1.1.4.28	Intradialytic	Status	Periodic	Numeric	XX.X	[pH]	0..1	O
MDC_HDIALY_DIALYSATE_VOL_DELIV (158848)		**Dialysis Fluid**	Total Dialysate Volume	Total amount of dialysate used during a treatment	1.1.4.29	Intradialytic	Status	Periodic	Numeric	XXX.XX	L	0..1	O
MDC_DEV_HDIALY_FILTER_CHAN (70955)					**1.1.5**							**1..1**	**M**
MDC_HDIALY_FILTER_NAME (158610)		**Filter (Dialyzer)**	Dialyzer Name	Dialyzer manufacturer and model	1.1.5.1	Intradialytic	Parameter	Episodic	String	Alphanumeric	N/A	0..1	O
MDC_HDIALY_FILTER_TRANSMEMBRANE_PRESS (158852)	tech high low	**Filter (Dialyzer)**	Actual Transmembrane Pressure	Difference in pressure between blood compartment and dialysate compartment of dialyzer	1.1.5.2	Intradialytic	Status	Periodic	Numeric	±XXX	mm[Hg]	1..1	M
MDC_HDIALY_FILTER_NUM (158611)		**Filter (Dialyzer)**	Filter Number	The filter number since the start of treatment. This value starts at 1 and increments with each new filter used during the current treatment.	1.1.5.3	Intradialytic	Status	Periodic	Numeric	X	N/A	0..1	O
MDC_HDIALY_FILTER_UDI (158612)		**Filter (Dialyzer)**	Filter UDI	The UDI for the current filter.	1.1.5.4	Intradialytic	Status	Periodic	String	N/A	N/A	0..1	O
MDC_DEV_HDIALY_CONVECTIVE_CHAN (70959)					1.1.6							**1..1**	**C8**
MDC_HDIALY_RF_DILUTION_LOCATION (158613)		**Replacement Fluid**	Replacement Fluid Dilution Location	Delivery location of the replacement fluid	1.1.6.1	Intradialytic	Parameter	Episodic	_TBL_08	Alphanumeric	N/A	1..1	C8
MDC_HDIALY_RF_POST_FILTER_NAME (158614)		**Replacement Fluid**	Post Filter RF Name	String containing a descriptive name of the post-filter replacement fluid	1.1.6.2	Intradialytic	Parameter	Episodic	String	Alphanumeric	N/A	1..1	O
MDC_HDIALY_RF_POST_FILTER_CONC_ACETATE (158856)		**Replacement Fluid**	Post-Filter RF Acetate Concentration	Acetate concentration in the post-filter replacement fluid	1.1.6.3	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O
MDC_HDIALY_RF_POST_FILTER_CONC_HCO3 (158860)		**Replacement Fluid**	Post-Filter RF Bicarbonate Concentration	Bicarbonate concentration in the post-filter replacement fluid	1.1.6.4	Intradialytic	Parameter	Episodic	Numeric	XXX.X	mmol/L	0..1	O
MDC_HDIALY_RF_POST_FILTER_CONC_CHLORIDE (158864)		**Replacement Fluid**	Post-Filter RF Chloride Concentration	Chloride concentration in the post-filter replacement fluid	1.1.6.5	Intradialytic	Parameter	Episodic	Numeric	XXX	mmol/L	0..1	O
MDC_HDIALY_RF_POST_FILTER_CONC_MG (158868)		**Replacement Fluid**	Post-Filter RF Magnesium Concentration	Magnesium concentration in the post-filter replacement fluid	1.1.6.6	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O

Table 1 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Obser-vation Sub ID	Phase	Message	Temp-oral	Data Type	Format	UCUM UOM	CARD	USE
MDC_HDIALY_RF_POST_FILTER_CONC_CA (158872)		**Replacement Fluid**	Post-Filter RF Calcium Concentration	Calcium concentration in the post-filter replacement fluid	1.1.6.7	Intradialytic	Parameter	Episodic	Numeric	X.XX	mmol/L	0..1	O
MDC_HDIALY_RF_POST_FILTER_CONC_CITRATE (158876)		**Replacement Fluid**	Post-Filter RF Citrate Concentration	Citrate concentration in the post-filter replacement fluid	1.1.6.8	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O
MDC_HDIALY_RF_POST_FILTER_CONC_GLU (158880)		**Replacement Fluid**	Post-Filter RF Glucose Concentration	Glucose concentration in the post-filter replacement fluid	1.1.6.9	Intradialytic	Parameter	Episodic	Numeric	XXX	mmol/L	0..1	O
MDC_HDIALY_RF_POST_FILTER_CONC_K (158884)		**Replacement Fluid**	Post-Filter RF Potassium Concentration	Potassium concentration in the post-filter replacement fluid	1.1.6.10	Intradialytic	Parameter	Episodic	Numeric	X.X	mmol/L	0..1	O
MDC_HDIALY_RF_POST_FILTER_CONC_NA (158888)		**Replacement Fluid**	Post-Filter RF Sodium Concentration	Sodium concentration in the post-filter replacement fluid	1.1.6.11	Intradialytic	Parameter	Episodic	Numeric	XXXX	mmol/L	0..1	O
MDC_HDIALY_RF_POST_FILTER_FLOW_RATE (158892)		**Replacement Fluid**	Actual Post-Filter Replacement Fluid Flow Rate	Rate of post -filter replacement fluid flow at any given point during a treatment	1.1.6.12	Intradialytic	Status	Periodic	Numeric	XXXX	mL/min	1..1	C7
MDC_HDIALY_RF_POST_FILTER_FLOW_RATE_SETTING (16936108)		**Replacement Fluid**	Post-Filter Replacement Fluid Flow Rate Setting	Rate at which the user programmed the post -filter replacement fluid flow	1.1.6.13	Intradialytic	Parameter	Episodic	Numeric	XXXX	mL/min	0..1	C7
MDC_HDIALY_RF_POST_FILTER_FLOW_RATE_MEAN (158895)		**Replacement Fluid**	Average Post-Filter Replacement Fluid Flow Rate	Average rate of post -filter replacement fluid flow during course of treatment.	1.1.6.14	Intradialytic	Status	Periodic	Numeric	XXXX	mL/min	0..1	O
MDC_HDIALY_RF_POST_FILTER_TEMP (158896)		**Replacement Fluid**	Actual Post-Filter Replacement Fluid Temperature	Temperature of post-filter replacement fluid	1.1.6.15	Intradialytic	Status	Periodic	Numeric	XX.X	Cel	1..1	C7
MDC_HDIALY_RF_POST_FILTER_TEMP_SETTING (16936112)		**Replacement Fluid**	Post-Filter Replacement Fluid Temperature Setting	Temperature at which post-filter replacement fluid is to be delivered to patient	1.1.6.16	Intradialytic	Parameter	Episodic	Numeric	XX.X	Cel	1..1	C7
MDC_HDIALY_RF_POST_FILTER_VOL (158900)		**Replacement Fluid**	Total Post-Filter Replacement Fluid Volume	Total amount of post -filter replacement fluid used during a treatment	1.1.6.17	Intradialytic	Status	Periodic	Numeric	XXX.XX	L	0..1	O
MDC_HDIALY_RF_POST_FILTER_VOL_SETTING (16936116)		**Replacement Fluid**	Post-Filter Replacement Fluid Volume setting	Programmed total amount of post -filter replacement fluid volume	1.1.6.18	Intradialytic	Parameter	Episodic	Numeric	XXX.XX	L	0..1	O
MDC_HDIALY_RF_PRE_FILTER_NAME (158615)		**Replacement Fluid**	Pre-Filter RF Name	String containing a descriptive name of the pre-filter replacement fluid	1.1.6.19	Intradialytic	Parameter	Episodic	String	Alphanumeric	N/A	1..1	O

Table 1 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Obser-vation Sub ID	Phase	Message	Temp-oral	Data Type	Format	UCUM UOM	CARD	USE
MDC_HDIALY_RF_PRE_FILTER_CONC_ACETATE (158904)		**Replacement Fluid**	Pre-Filter RF Acetate Concentration	Acetate concentration in the pre-filter replacement fluid	1.1.6.20	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O
MDC_HDIALY_RF_PRE_FILTER_CONC_HCO3 (158908)		**Replacement Fluid**	Pre-Filter RF Bicarbonate Concentration	Bicarbonate concentration in the pre-filter replacement fluid	1.1.6.21	Intradialytic	Parameter	Episodic	Numeric	XXX.X	mmol/L	0..1	O
MDC_HDIALY_RF_PRE_FILTER_CONC_CHLORIDE (158912)		**Replacement Fluid**	Pre-Filter RF Chloride Concentration	Chloride concentration in the pre-filter replacement fluid	1.1.6.22	Intradialytic	Parameter	Episodic	Numeric	XXX	mmol/L	0..1	O
MDC_HDIALY_RF_PRE_FILTER_CONC_MG (158916)		**Replacement Fluid**	Pre-Filter RF Magnesium Concentration	Magnesium concentration in the pre-filter replacement fluid	1.1.6.23	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O
MDC_HDIALY_RF_PRE_FILTER_CONC_CA (158920)		**Replacement Fluid**	Pre-Filter RF Calcium Concentration	Calcium concentration in the pre-filter replacement fluid	1.1.6.24	Intradialytic	Parameter	Episodic	Numeric	X.XX	mmol/L	0..1	O
MDC_HDIALY_RF_PRE_FILTER_CONC_CITRATE (158924)		**Replacement Fluid**	Pre-Filter RF Citrate Concentration	Citrate concentration in the pre-filter replacement fluid	1.1.6.25	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O
MDC_HDIALY_RF_PRE_FILTER_CONC_GLU (158928)		**Replacement Fluid**	Pre-Filter RF Glucose Concentration	Glucose concentration in the pre-filter replacement fluid	1.1.6.26	Intradialytic	Parameter	Episodic	Numeric	XXX	mmol/L	0..1	O
MDC_HDIALY_RF_PRE_FILTER_CONC_K (158932)		**Replacement Fluid**	Pre-Filter RF Potassium Concentration	Potassium concentration in the pre-filter replacement fluid	1.1.6.27	Intradialytic	Parameter	Episodic	Numeric	X.X	mmol/L	0..1	O
MDC_HDIALY_RF_PRE_FILTER_CONC_NA (158936)		**Replacement Fluid**	Pre-Filter RF Sodium Concentration	Sodium concentration in the pre-filter replacement fluid	1.1.6.28	Intradialytic	Parameter	Episodic	Numeric	XXXX	mmol/L	0..1	O
MDC_HDIALY_RF_PRE_FILTER_FLOW_RATE (158940)		**Replacement Fluid**	Actual Pre-Filter Replacement Fluid Flow Rate	Rate of pre-filter replacement fluid flow at any given point during a treatment	1.1.6.29	Intradialytic	Status	Periodic	Numeric	XXXX	mL/min	1..1	C7
MDC_HDIALY_RF_PRE_FILTER_FLOW_RATE_SETTING (16936156)		**Replacement Fluid**	Pre-Filter Replacement Fluid Flow Rate Setting	Rate at which the user programmed the pre-filter replacement fluid flow	1.1.6.30	Intradialytic	Parameter	Episodic	Numeric	XXXX	mL/min	0..1	C8
MDC_HDIALY_RF_PRE_FILTER_FLOW_RATE_MEAN (158943)		**Replacement Fluid**	Average Pre-Filter Replacement Fluid Flow Rate	Average rate of pre-filter replacement fluid flow during course of treatment.	1.1.6.31	Intradialytic	Status	Periodic	Numeric	XXXX	mL/min	0..1	O
MDC_HDIALY_RF_PRE_FILTER_TEMP (158944)		**Replacement Fluid**	Actual Pre-Filter Replacement Fluid Temperature	Temperature of pre-filter replacement fluid	1.1.6.32	Intradialytic	Status	Periodic	Numeric	XX.X	Cel	1..1	C7
MDC_HDIALY_RF_PRE_FILTER_TEMP_SETTING (16936160)		**Replacement Fluid**	Pre-Filter Replacement Fluid Temperature Setting	Temperature at which pre-filter replacement fluid is to be delivered to patient	1.1.6.33	Intradialytic	Parameter	Episodic	Numeric	XX.X	Cel	1..1	C7

Table 1 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Obser-vation Sub ID	Phase	Message	Temp-oral	Data Type	Format	UCUM UOM	CARD	USE
MDC_HDIALY_RF_PRE_FILTER_VOL (158948)		**Replacement Fluid**	Total Pre-Filter Replacement Fluid Volume	Total amount of pre-filter replacement fluid used during a treatment	1.1.6.34	Intradialytic	Status	Periodic	Numeric	XXX.XX	L	0..1	O
MDC_HDIALY_RF_PRE_FILTER_VOL_SETTING (16936164)		**Replacement Fluid**	Pre-Filter Replacement Fluid Volume Setting	Programmed total amount of pre -filter replacement fluid volume	1.1.6.35	Intradialytic	Parameter	Episodic	Numeric	XXX.XX	L	0..1	O
MDC_HDIALY_RF_CONV_CLEARANCE (158952)		**Replacement Fluid**	Convective Clearance - Urea	The product of the sieving coefficient and the total water flux. KX = QUF x SX where KX is Convective Clearance for solute "X", QUF is Ultrafiltration flow across membrane and SX is Membrane sieving coefficient for solute "X"	1.1.6.36	Intradialytic	Status	Periodic	Numeric	XXX.X	mL/min	0..1	O
MDC_EVT_HDIALY_RF_EXCESS_DELIV (198246)	tech-high	**Replacement Fluid**	Excessive Replacement Fluid Bolus Delivered	Notification that more replacement fluid has been delivered than intended	1.1.6.37	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O
MDC_EVT_HDIALY_RF_INSUFF_DELIV (198248)	tech-low	**Replacement Fluid**	Insufficient Replacement Fluid Bolus Delivered	Notification that less replacement fluid has been delivered than intended	1.1.6.38	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O
MDC_HDIALY_RF_PRE_POST_FLOW_RATIO_SETTING (16936172)		**Replacement Fluid**	Pre-Post Replacement Fluid Flow Rate Ratio Setting	The ratio desired between the pre and post Replacement Fluid Flow Rate Settings	1.1.6.39	Intradialytic	Parameter	Episodic	Numeric	XX.X	N/A	0..1	O
MDC_HDIALY_RF_BOLUS_RATE (158960)	tech high low	**Replacement Fluid**	Replacement Fluid Bolus Rate	User defined replacement fluid bolus rate.	1.1.6.40	Intradialytic	Parameter	Episodic	Numeric	XXXX	mL/min	0..1	C9
MDC_HDIALY_RF_BOLUS_VOL_SETTING (16936180)		**Replacement Fluid**	Replacement Fluid Bolus Volume Setting	User defined amount of replacement fluid to be delivered in this single large dose	1.1.6.41	Intradialytic	Parameter	Episodic	Numeric	XXX	mL	0..1	C9
MDC_HDIALY_RF_BOLUS_VOL_DELIVERED (158968)	tech high low	**Replacement Fluid**	Replacement Fluid Bolus Volume Delivered	Amount of replacement fluid delivered in a single large dose.	1.1.6.42	Intradialytic	Parameter	Episodic	Numeric	XXX	mL	0..1	C9
MDC_HDIALY_RF_FLOW_MODE (158616)		**Replacement Fluid**	Replacement Fluid Flow Mode	The mode of controlling replacement fluid flow rate	1.1.6.43	All	Parameter	Episodic	_TBL_07	Alphanumeric	N/A	1..1	C8
MDC_HDIALY_RF_SOURCE (158617)		**Replacement Fluid**	Replacement Fluid Source	The source of the replacement fluid.	1.1.6.44	Intradialytic	Status	Episodic	_TBL_09	Alphanumeric	N/A	0..1	O
MDC_EVT_HDIALY_RF_BOLUS (198250)		**Replacement Fluid**	Replacement Fluid Bolus Event	True when an RF Bolus is occurring.	1.1.6.45	Intradialytic	Status	Episodic	Bool	T / F	N/A	0..1	C9

Table 1 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Obser-vation Sub ID	Phase	Message	Temp-oral	Data Type	Format	UCUM UOM	CARD	USE
MDC_DEV_HDIALY_SAFETY_SYSTEMS_CHAN (70963)					1.1.7							**1..1**	**M**
MDC_EVT_HDIALY_SAFETY_ART_AIR_DETECT (198252)	tech	**Safety Systems**	Arterial Air Detector	Notification that air is sensed in the arterial blood lines	1.1.7.1	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	M
MDC_EVT_HDIALY_SAFETY_DIALYSATE_AIR_DETECT (198254)	tech	**Safety Systems**	Dialysate Air Detector	Notification that air is sensed in dialysate line	1.1.7.2	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	C6
MDC_EVT_HDIALY_SAFETY_DIALYSATE_COMPOSITION (198256)	tech	**Safety Systems**	Dialysis Composition	Notification that the dialyzing fluid composition is incorrect	1.1.7.3	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O
MDC_EVT_HDIALY_SAFETY_SYSTEM_GENERAL (198258)	tech	**Safety Systems**	General System	Notification of any dialysis machine malfunction that are not related to patient treatment	1.1.7.4	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	M
MDC_EVT_SELFTEST_FAILURE (198216)	tech	**Safety Systems**	Self-Test	Notification that a self-test failed	1.1.7.5	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	M
MDC_EVT_HDIALY_SAFETY_VEN_ACCESS (198260)	tech	**Safety Systems**	Venous Access	Notification that the venous access may have become disconnected	1.1.7.6	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O
MDC_EVT_HDIALY_SAFETY_VEN_AIR_DETECT (198262)	tech	**Safety Systems**	Venous Air Detector	Notification that air is sensed in the venous blood lines	1.1.7.7	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	M
MDC_EVT_HDIALY_SAFETY_WETNESS_DETECT_ALERT (198264)	tech	**Safety Systems**	Wetness Detector	Notification that the wetness detector has sensed fluid	1.1.7.8	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O
MDC_EVT_HDIALY_SAFETY_WETNESS_DETECT_ERROR (198266)	tech	**Safety Systems**	Wetness Detector Error	Notification of a detected error on the wetness detector device	1.1.7.9	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O
MDC_ATTR_ALERT_ID_NUM (68489)		**Safety Systems**	Alert ID	The number associated with the current alert. If no alert is active then this object is not reported.	1.1.7.10	Intradialytic	Status	Episodic	Numeric	XXXX	N/A	0..1	0
MDC_ATTR_ALERT_TEXT (68546)		**Safety Systems**	Alert Text	The text name of the current alert. If no alert is active then this object is not reported. IN most case this object will contain the text shown to the user.	1.1.7.11	Intradialytic	Status	Episodic	String	N/A	N/A	0..1	0
MDC_DEV_HDIALY_THERAPY_OUTCOMES_CHAN (70967)					1.1.8							**1..1**	**M**
MDC_HDIALY_THERAPY_MASS_TRF_AREA_COEFF (158972)		**Therapy Outcomes**	KoA	Overall mass transfer coefficient multiplied by surface area of a dialyzer	1.1.8.1	Intradialytic	Status	Episodic	Numeric	XXXX	N/A	0..1	O

Table 1 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Observation Sub ID	Phase	Message	Temporal	Data Type	Format	UCUM UOM	CARD	USE
MDC_HDIALY_THERAPY_ACCESS_FLOW (158976)		**Therapy Outcomes**	Access Flow	Flow through a fistula or other conduit connecting an artery to a vein	1.1.8.2	Intradialytic	Status	Periodic	Numeric	±XXXX	mL/min	0..1	O
MDC_HDIALY_THERAPY_RATIO_EKT_OVER_V_DELIVERED (158980)		**Therapy Outcomes**	Delivered Equilibrated Kt/V	Fractional solute clearance for an intermittent treatment corrected to take account of solute redistribution following the treatment	1.1.8.4	Intradialytic	Status	Episodic	Numeric	X.XX	%	0..1	O
MDC_HDIALY_THERAPY_KT_DELIVERED (158984)		**Therapy Outcomes**	Delivered Kt	Volume of fluid cleared of urea by dialysis treatment	1.1.8.5	Intradialytic	Status	Episodic	Numeric	X.XX	L	0..1	O
MDC_HDIALY_THERAPY_RATIO_SPKT_OVER_V_DELIVERED (158988)		**Therapy Outcomes**	Delivered Single Pool Kt/V	Fractional solute clearance, calculated on the basis of solute concentration before and after an intermittent treatment, and on the basis of effluent dialysate volume and anthropometric estimate of volume of urea distribution for peritoneal dialysis	1.1.8.6	Intradialytic	Status	Episodic	Numeric	X.XX	%	0..1	O
MDC_EVT_HDIALY_THERAPY_PAT_TX_GENERAL (198268)	phys	**Therapy Outcomes**	General Patient Treatment	Notification that the machine has detected an alarm condition not covered by other alarms that is related to patient treatment.	1.1.8.7	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O
MDC_HDIALY_THERAPY_RATIO_KT_OVER_V_GOAL (158992)		**Therapy Outcomes**	Kt/V Goal	Target dialysis treatment adequacy measurement	1.1.8.10	Intradialytic	Parameter	Episodic	Numeric	X.XX	%	0..1	O
MDC_HDIALY_THERAPY_UREA_CLEARANCE_MEAN (159019)		**Therapy Outcomes**	Mean Urea Clearance	Time weighted average of the individual effective conductivity clearance measurements	1.1.8.11	Intradialytic	Status	Episodic	Numeric	XXX	N/A	0..1	O
MDC_HDIALY_THERAPY_BODY_START_WT (159000)		**Therapy Outcomes**	Patient Start Weight	Weight of patient at beginning of treatment	1.1.8.12	All	Parameter	Episodic	Numeric	XXX.X	Kg	0..1	O
MDC_HDIALY_THERAPY_PCT_RECIRC (159004)		**Therapy Outcomes**	Percent Recirculation	Percentage of the blood flow in the access line that is coming directly from the venous line without going through the patient's body.	1.1.8.13	Intradialytic	Status	Periodic	Numeric	±XXX.X	%	0..1	O
MDC_HDIALY_THERAPY_PLASMA_NA_CONC (159008)		**Therapy Outcomes**	Plasma Sodium Concentration	Sodium ion concentration measured in patient plasma.	1.1.8.14	Intradialytic	Status	Episodic	Numeric	XXX	mmol/L	0..1	O

Table 1 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Obser-vation Sub ID	Phase	Message	Temp-oral	Data Type	Format	UCUM UOM	CARD	USE
MDC_HDIALY_THERAPY_RATIO_SPKT_OVER_V_PROJECTED (159012)		**Therapy Outcomes**	Projected Single Pool Kt/V	Fractional solute clearance, calculated on the basis of solute concentration before and after an intermittent treatment, and on the basis of effluent dialysate volume and anthropometric estimate of volume of urea distribution for peritoneal dialysis, projected on the basis of data available before the treatment occurs or before the treatment is completed	1.1.8.16	Intradialytic	Status	Episodic	Numeric	X.XX	%	0..1	O
MDC_HDIALY_THERAPY_COMPLETE_METHOD (158618)		**Therapy Outcomes**	Treatment Completion Method	Parameter used to determine when treatment has been complete	1.1.8.18	Intradialytic	Status	Episodic	_TBL_12	Alphanumeric	N/A	1..1	M
MDC_EVT_HDIALY_THERAPY_TX_END_TIME (198270)	tech	**Therapy Outcomes**	Treatment Time Ended	Notification that target time of treatment has been met	1.1.8.19	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O
MDC_HDIALY_THERAPY_UREA_CLEARANCE (159016)		**Therapy Outcomes**	Urea Clearance	Calculated clearance based on the change in conductivity of the pre-dialyzer vs post dialyzer dialysate.	1.1.8.20	Intradialytic	Status	Episodic	Numeric	XXX	N/A	0..1	O
MDC_HDIALY_THERAPY_BODY_END_WT (159020)		**Therapy Outcomes**	Patient End Weight	Weight of patient at end of treatment	1.1.8.21	All	Parameter	Episodic	Numeric	XXX.X	Kg	0..1	O
MDC_DEV_HDIALY_UF_CHAN (70971)					**1.1.9**							**1..1**	**M**
MDC_EVT_HDIALY_UF_LO (198272)	tech-low	**Ultrafiltration System**	Insufficient Ultrafiltration	Notification that the ultrafiltration system is not removing as much fluid as intended	1.1.9.1	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O
MDC_EVT_HDIALY_UF_NEG (198274)	tech-low	**Ultrafiltration System**	Negative Ultrafiltration	Notification that the ultrafiltration system has resulted in a negative ultrafiltration rate	1.1.9.2	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O
MDC_HDIALY_UF_TIME_TO_TARGET (159024)		**Ultrafiltration System**	Remaining Ultrafiltration Time	Time remaining until target volume to remove will have been achieved.	1.1.9.3	Intradialytic	Status	Periodic	Numeric	XXXX	min	0..1	O
MDC_HDIALY_UF_TARGET_VOL_TO_REMOVE (159028)		**Ultrafiltration System**	Target Volume To Remove	Planned fluid removal	1.1.9.4	Intradialytic	Parameter	Episodic	Numeric	XXXX	mL	1..1	C11
MDC_HDIALY_UF_ACTUAL_REMOVED_VOL (159032)		**Ultrafiltration System**	Total Fluid Volume Removed	Measured fluid removed from patient	1.1.9.5	Intradialytic	Status	Periodic	Numeric	XXXX	mL	1..1	M
MDC_EVT_HDIALY_UF_GOAL_MET (198278)	tech	**Ultrafiltration System**	Ultrafiltration Goal Met	Notification that target ultrafiltration volume has been met	1.1.9.6	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O
MDC_HDIALY_UF_MODE (158619)		**Ultrafiltration System**	Ultrafiltration Mode	Process used to remove fluid volume from the patient	1.1.9.7	Intradialytic	Parameter	Episodic	_TBL_13	Alphanumeric	N/A	1..1	M

Table 1 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Obser-vation Sub ID	Phase	Message	Temp-oral	Data Type	Format	UCUM UOM	CARD	USE
MDC_HDIALY_UF_RATE (159036)		**Ultrafiltration System**	Ultrafiltration Rate	Current rate at which fluid is removed from the patient	1.1.9.8	Intradialytic	Status	Periodic	Numeric	XXXX	mL/h	1..1	M
MDC_HDIALY_UF_RATE_SETTING (16936252)		**Ultrafiltration System**	Ultrafiltration Rate	Rate at which fluid is removed from the patient	1.1.9.9	Intradialytic	Status	Periodic	Numeric	XXXX	mL/h	1..1	M
MDC_EVT_HDIALY_UF_RATE_RANGE (198276)	tech-range	**Ultrafiltration System**	Ultrafiltration Rate Out of Range	Notification that the ultrafiltration rate has deviated from the intended ultrafiltration rate more than is safe. Specified another way, MDC_HDIALY_UF_RATE is not between MDC_HDIALY_UF_RATE_LIMIT_LOW_SETTING and MDC_HDIALY_UF_RATE_LIMIT_HIGH_SETTING	1.1.9.10	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	M
MDC_HDIALY_UF_RATE_LIMIT_HIGH_SETTING (16936257)		**Ultrafiltration System**	UF Rate Upper Limit	Maximum ultrafiltration rate allowed without an alarm generation.	1.1.9.11	Intradialytic	Parameter	Episodic	Numeric	XXXX	mL/h	0..1	O
MDC_HDIALY_UF_RATE_LIMIT_LOW_SETTING (16936259)		**Ultrafiltration System**	UF Rate Lower Limit	Maximum ultrafiltration rate allowed without an alarm generation.	1.1.9.12	Intradialytic	Parameter	Episodic	Numeric	XXXX	mL/h	0..1	O
MDC_DEV_PRESS_BLD_NONINV_VMD (70686)				**Non-Invasive Blood Pressure Monitor**	**1.2**							**0..1**	**O**
MDC_DEV_PRESS_BLD_NONINV_CHAN (70687)					**1.2.1**							**0..1**	**O**
MDC_ATTR_TIME_PD_MSMT (67979)		**Blood Pressure Monitor**	Blood Pressure Measurement Interval Setting	Time allowed to elapse between automatic blood pressure measurements. A value of zero indicates that automatic measurements are not being taken.	1.2.1.1	All	Parameter	Episodic	Numeric	XXX	min	0..1	O
MDC_ATTR_PT_BODY_POSN (68135)		**Blood Pressure Monitor**	Blood Pressure Measurement Position	Patient position at time of blood pressure measurement	1.2.1.2	All	Blood Pressure	Episodic	_TBL_04	Alphanumeric	N/A	0..1	O
MDC_PRESS_BLD_NONINV_DIA (150022)	phys high low thr	**Blood Pressure Monitor**	Diastolic Pressure	Minimum arterial pressure during relaxation and dilatation of the ventricles of the heart when the ventricles fill with blood	1.2.1.3	All	Blood Pressure	Episodic	Numeric	XXX	mm[Hg]	0..1	O
MDC_PULS_RATE_NON_INV (149546)	phys high low thr	**Blood Pressure Monitor**	Heart Rate	Number of heart beats per minute	1.2.1.4	All	Blood Pressure	Episodic	Numeric	XXX	{beats}/min	0..1	O
MDC_PRESS_BLD_NONINV_MEAN (150023)		**Blood Pressure Monitor**	Mean Arterial Pressure	Average pressure in a patient's arteries during one cardiac cycle	1.2.1.5	All	Blood Pressure	Episodic	Numeric	XXX	mm[Hg]	0..1	O

Table 1 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Obser-vation Sub ID	Phase	Message	Temp-oral	Data Type	Format	UCUM UOM	CARD	USE
MDC_PRESS_BLD_NONINV_SYS (150021)	phys high low thr	**Blood Pressure Monitor**	Systolic Pressure	Maximum arterial pressure during contraction of the left ventricle of the heart	1.2.1.6	All	Blood Pressure	Episodic	Numeric	XXX	mm[Hg]	0..1	O
MDC_DEV_ANALY_SAT_O2_VMD (69642)					1.3							0..1	O
MDC_DEV_ANALY_SAT_O2_CHAN (69643)					1.3.1							0..1	O
MDC_PULS_OXIM_SAT_O2 (150456)	phys high low thr	**Pulse Oximeter Monitor**	SpO2 Oxygen Saturation	Hemoglobin oxygen saturation in patient blood measured by pulse oximetry	1.3.1.1	Intradialytic	SpO2	Periodic	Numeric	XXX	%	0..1	O
MDC_PULS_OXIM_PULS_RATE (149530)	phys high low thr	**Pulse Oximeter Monitor**	SpO2 Pulse Rate	Number of heart beats per minute measured by pulse oximetry	1.3.1.2	Intradialytic	SpO2 Pulse Rate	Periodic	Numeric	XXX	{beats}/min	0..1	O
MDC_EVT_ERR (196638)	tech	**Safety Systems**	Pulse Oximeter Error	Notification of a detected error on the pulse oximeter device	1.3.1.3	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O
MDC_DEV_BLOOD_CHEM_VMD (70974)					**1.4**							**0..1**	**O**
MDC_DEV_BLOOD_CHEM_CHAN (70975)				**Blood Chemistry Channel**	**1.4.1**							**0..1**	**O**
MDC_HDIALY_PLASMA_VOL_MARKER (158620)		**Therapy Outcomes**	Plasma Volume Marker	An indicator applied to the blood volume percent reading to designate an event	1.4.1.1	Intradialytic	Status	Periodic	_TBL_10	Alphanumeric	N/A	0..1	O
MDC_HDIALY_PLASMA_VOL_PROFILE (158621)		**Therapy Outcomes**	Plasma Volume Profile	The rate of change in relative blood volume.	1.4.1.2	Intradialytic	Status	Periodic	_TBL_11	Alphanumeric	N/A	0..1	O
MDC_CONC_HCT_GEN (160132)	phys low high thr	**Therapy Outcomes**	Hematocrit	100*(sample red blood cell volume/blood sample volume)	1.4.1.3	Intradialytic	Status	Periodic	Numeric	XX.X	%{vol}	0..1	O
MDC_CONC_HB_GEN (160120)	phys low high thr	**Therapy Outcomes**	Hemoglobin	Concentration of hemoglobin in a sample expressed as mass/volume	1.4.1.4	Intradialytic	Status	Periodic	Numeric	±XXX.X	g/dL	0..1	O
MDC_HDIALY_REL_BLOOD_VOL (159044)	phys low thr	**Therapy Outcomes**	Relative Blood Volume	The percent change in blood volume since the start of the treatment. The BV change value is calculated from the following equation: ΔBV% = [(H0/H1) - 1] x 100 Where H0 = initial Hct or Hb H1 = current Hct or Hb	1.4.1.5	Intradialytic	Alert	Episodic	Numeric	XXX.X	%	0..1	O
MDC_SAT_O2 (150316)	phys low high thr	**Therapy Outcomes**	SpO2 Oxygen Saturation	Hemoglobin oxygen saturation in patient blood	1.4.1.6	Intradialytic	Status	Periodic	Numeric	XXX	%	0..1	O

7.4 Alarms/Alerts

Table 2 – Dialysis Machine Alarms/Alerts

Source Identifier	Event Identifier[1]	Alert Type	Dialysis Common Name	Definition	Use
MDC_DEV_HDIALY_MACHINE_MDS					
MDC_DEV_HDIALY_VMD					
MDC_DEV_HDIALY_MACH_CONFIG_CHAN					
MDC_DEV_HDIALY_ANTICOAG_PUMP_CHAN					
MDC_HDIALY_ANTICOAG_PUMP_CHAN	MDC_EVT_HDIALY_ANTICOAG_STOP	tech	Anticoagulant Pump Stop	Notification that the anticoagulant pump has stopped	O
MDC_HDIALY_ANTICOAG_PUMP_CHAN	MDC_EVT_HDIALY_ANTICOAG_SYRINGE_EMPTY	tech	Syringe Empty	Notification that the syringe plunger has reached the end of its functional range	O
MDC_HDIALY_ANTICOAG_PUMP_CHAN	MDC_EVT_HDIALY_ANTICOAG_SYRINGE_SIZE	tech	Wrong Syringe Size	Notification that the size of the syringe is not the size defined for anticoagulant administration	O
MDC_DEV_HDIALY_BLOOD_PUMP_CHAN					
MDC_HDIALY_BLD_PRESS_ART	MDC_EVT_HI	tech high thr	Arterial Pressure High	Notification that the arterial pressure has exceeded maximum setting	M
MDC_HDIALY_BLD_PRESS_ART	MDC_EVT_LO	tech low thr	Arterial Pressure Low	Notification that the arterial pressure has fallen below the minimum setting	M
MDC_HDIALY_BLOOD_PUMP_CHAN	MDC_EVT_HDIALY_BLD_PUMP_STOP	tech	Blood Pump Stop	Notification that the blood pump has stopped	M
MDC_HDIALY_BLD_PUMP_PRESS_ART_POST_PUMP	MDC_EVT_HI	tech high thr	Post Pump Arterial Pressure High	Notification that the post-pump arterial pressure is above limit.	O
MDC_HDIALY_BLD_PUMP_PRESS_ART_POST_PUMP	MDC_EVT_LO	tech low thr	Post Pump Arterial Pressure Low	Notification that the post-pump arterial pressure is below limit.	O
MDC_HDIALY_BLD_PUMP_SINGLE_NEEDLE_PRESS	MDC_EVT_HI	tech high thr	Needle Pressure High	Notification that the needle pressure is above limit.	O
MDC_HDIALY_BLD_PUMP_SINGLE_NEEDLE_PRESS	MDC_EVT_LO	tech low thr	Needle Pressure Low	Notification that the needle pressure is below limit.	O
MDC_HDIALY_BLD_PUMP_PRESS_VEN	MDC_EVT_HI	tech high thr	Venous Pressure High	Notification that the venous pressure has exceeded maximum setting	M
MDC_HDIALY_BLD_PUMP_PRESS_VEN	MDC_EVT_LO	tech low thr	Venous Pressure Low	Notification that the venous pressure has fallen below the minimum setting	M
MDC_DEV_HDIALY_FLUID_CHAN					
MDC_HDIALY_DIALYSATE_COND	MDC_EVT_HI	tech high	Conductivity High	Notification that the conductivity of the dialysate has exceeded the maximum setting	O
MDC_HDIALY_DIALYSATE_COND	MDC_EVT_LO	tech low	Conductivity Low	Notification that the conductivity of the dialysate has fallen below the minimum setting	O
MDC_HDIALY_DIALYSATE_FLOW_RATE	MDC_EVT_LO	tech low	Dialysate Flow Low	Notification that the dialysate flow is below the dialysate flow rate minimum setting	O
MDC_HDIALY_DIALYSATE_TEMP	MDC_EVT_LO	tech low	Dialysate Temperature Low	Notification that the dialysate temperate has fallen below the minimum temperate setting	C (if mode is HD or HDF)
MDC_HDIALY_DIALYSATE_TEMP	MDC_EVT_HI	tech high	Dialysate Temperature High	Notification that the dialysate temperate exceeds the maximum temperate setting	C (if mode is HD or HDF)
MDC_HDIALY_FLUID_CHAN	MDC_EVT_HDIALY_BLOOD_LEAK	tech	Blood Leak	Notification that blood has been detected in the dialysate fluid	M

Table 2 – Dialysis Machine Alarms/Alerts

Source Identifier	Event Identifier[1]	Alert Type	Dialysis Common Name	Definition	Use
MDC_DEV_HDIALY_FILTER_CHAN					
MDC_HDIALY_FILTER_TRANSMEMBRANE_PRESS	MDC_EVT_LO	tech low	Transmembrane Pressure Low	Notification that transmembrane pressure has fallen below the minimum setting	M
MDC_HDIALY_FILTER_TRANSMEMBRANE_PRESS	MDC_EVT_HI	tech high	Transmembrane Pressure High	Notification that transmembrane pressure has exceeded the maximum setting	M
MDC_DEV_HDIALY_CONVECTIVE_CHAN					
MDC_HDIALY_CONVECTIVE_CHAN	MDC_EVT_HDIALY_RF_EXCESS_DELIV	tech-high	Excessive Replacement Fluid Bolus Delivered	Notification that more replacement fluid has been delivered than intended	O
MDC_HDIALY_CONVECTIVE_CHAN	MDC_EVT_HDIALY_REPLACE_FLUID_INSUFF_DELIV	tech-low	Insufficient Replacement Fluid Bolus Delivered	Notification that less replacement fluid has been delivered than intended	O
MDC_HDIALY_RF_BOLUS_RATE	MDC_EVT_HI	tech high	Replacement Fluid Bolus Rate High	Notification that the replacement fluid bolus is delivering more fluid than intended	O
MDC_HDIALY_RF_BOLUS_RATE	MDC_EVT_LO	tech low	Replacement Fluid Bolus Rate Low	Notification that the replacement fluid bolus is delivering less than the intended.	O
MDC_HDIALY_RF_BOLUS_VOL_DELIVERED	MDC_EVT_HI	tech high	Replacement Fluid Bolus Volume High	Notification that the replacement fluid bolus delivered more fluid than intended	O
MDC_HDIALY_RF_BOLUS_VOL_DELIVERED	MDC_EVT_LO	tech low	Replacement Fluid Bolus Volume Low	Notification that the replacement fluid bolus delivered less fluid than intended.	O
MDC_DEV_HDIALY_SAFETY_SYSTEMS_CHAN					
MDC_HDIALY_SAFETY_SYSTEMS_CHAN	MDC_EVT_HDIALY_SAFETY_ART_AIR_DETECT	tech	Arterial Air Detector	Notification that air is sensed in the arterial blood lines	M
MDC_HDIALY_SAFETY_SYSTEMS_CHAN	MDC_EVT_HDIALY_SAFETY_DIALYSATE_AIR_DETECT	tech	Dialysate Air Detector	Notification that air is sensed in dialysate line	C (if mode is HD or HDF)
MDC_HDIALY_SAFETY_SYSTEMS_CHAN	MDC_EVT_HDIALY_SAFETY_DIALYSATE_COMPOSITION	tech	Dialysis Composition	Notification that the dialyzing fluid composition is incorrect	O
MDC_HDIALY_SAFETY_SYSTEMS_CHAN	MDC_EVT_HDIALY_SAFETY_SYSTEM_GENERAL	tech	General System	Notification of any dialysis machine malfunction that are not related to patient treatment	M
MDC_HDIALY_SAFETY_SYSTEMS_CHAN	MDC_EVT_SELFTEST_FAILURE	tech	Self-Test	Notification that a self-test failed	M
MDC_HDIALY_SAFETY_SYSTEMS_CHAN	MDC_EVT_HDIALY_SAFETY_VEN_ACCESS	tech	Venous Access	Notification that the venous access may have become disconnected	O
MDC_HDIALY_SAFETY_SYSTEMS_CHAN	MDC_EVT_HDIALY_SAFETY_VEN_AIR_DETECT	tech	Venous Air Detector	Notification that air is sensed in the venous blood lines	M
MDC_HDIALY_SAFETY_SYSTEMS_CHAN	MDC_EVT_HDIALY_SAFETY_WETNESS_DETECT_ALERT	tech	Wetness Detector	Notification that the wetness detector has sensed fluid	O
MDC_HDIALY_SAFETY_SYSTEMS_CHAN	MDC_EVT_HDIALY_SAFETY_WETNESS_DETECT_ERROR	tech	Wetness Detector Error	Notification of a detected error on the wetness detector device	O
MDC_DEV_HDIALY_THERAPY_OUTCOMES_CHAN					
MDC_HDIALY_THERAPY_OUTCOMES_CHAN	MDC_EVT_HDIALY_THERAPY_PAT_TX_GENERAL	phys	General Patient Treatment	Notification that the machine has detected an alarm condition not covered by other alarms that is related to patient treatment.	O
MDC_HDIALY_THERAPY_OUTCOMES_CHAN	MDC_EVT_HDIALY_THERAPY_TX_END_TIME	tech	Treatment Time Ended	Notification that target time of treatment has been met	O
MDC_DEV_HDIALY_UF_CHAN					
MDC_HDIALY_UF_CHAN	MDC_EVT_HDIALY_UF_LO	tech low	Insufficient Ultrafiltration	Notification that the ultrafiltration system is not removing as much fluid as intended	O

Table 2 – Dialysis Machine Alarms/Alerts

Source Identifier	Event Identifier[1]	Alert Type	Dialysis Common Name	Definition	Use
MDC_HDIALY_UF_CHAN	MDC_EVT_HDIALY_UF_NEG	tech low	Negative Ultrafiltration	Notification that the ultrafiltration system has resulted in a negative ultrafiltration rate	O
MDC_HDIALY_UF_CHAN	MDC_EVT_HDIALY_UF_GOAL_MET	tech	Ultrafiltration Goal Met	Notification that target ultrafiltration volume has been met	O
MDC_HDIALY_UF_CHAN	MDC_EVT_HDIALY_UF_RATE_RANGE	tech range	Ultrafiltration Rate Out of Range	Notification that the ultrafiltration rate has deviated from the intended ultrafiltration rate more than is safe	M
MDC_DEV_PRESS_BLD_NONINV_VMD					
MDC_DEV_PRESS_BLD_NONINV_CHAN					
MDC_PRESS_BLD_NONINV_DIA	MDC_EVT_HI	phys high thr	Diastolic High	Notification that diastolic pressure exceeded the diastolic maximum setting	O
MDC_PRESS_BLD_NONINV_DIA	MDC_EVT_LOW	phys low thr	Diastolic Low	Notification that diastolic pressure fell below the diastolic minimum setting	O
MDC_PULS_RATE_NON_INV	MDC_EVT_HI	phys high thr	Heart Rate High	Heart rate exceeded heart rate maximum setting	O
MDC_PULS_RATE_NON_INV	MDC_EVT_LOW	phys low thr	Heart Rate Low	Heart rate fell below heart rate minimum setting	O
MDC_PRESS_BLD_NONINV_SYS	MDC_EVT_HI	phys high thr	Systolic High	Notification that systolic pressure exceeded the systolic maximum setting	O
MDC_PRESS_BLD_NONINV_SYS	MDC_EVT_LOW	phys low thr	Systolic Low	Notification that systolic pressure fell below the systolic minimum setting	O
MDC_DEV_ANALY_SAT_O2_VMD					
MDC_DEV_ANALY_SAT_O2_CHAN					
MDC_PULS_OXIM_SAT_O2	MDC_EVT_HI	phys high thr	Oximeter Oxygen Saturation High	Notification that Oxygen Saturation is above limit.	O
MDC_PULS_OXIM_SAT_O2	MDC_EVT_LO	phys low thr	Oximeter Oxygen Saturation Low	Notification that Oxygen Saturation is below limit.	
MDC_PULS_OXIM_PULS_RATE	MDC_EVT_HI	phys high thr	Oximeter Pulse High	Notification that the pulse rate measure by the pulse oximeter is above limit.	O
MDC_PULS_OXIM_PULS_RATE	MDC_EVT_LO	phys low thr	Oximeter Pulse Low	Notification that the pulse rate measure by the pulse oximeter is below limit.	
MDC_DEV_ANALY_SAT_O2_CHAN	MDC_EVT_ERR	tech	Pulse Oximeter Error	Notification of a detected error on the pulse oximeter device	O
MDC_DEV_BLOOD_CHEM_VMD					
MDC_DEV_BLOOD_CHEM_CHAN					
MDC_CONC_HCT	MDC_EVT_HI	phys high thr	Hematocrit High	Notification that patient hematocrit has risen above limit.	O
MDC_CONC_HCT	MDC_EVT_LO	phys low thr	Hematocrit Low	Notification that patient hematocrit has fallen below limit.	O
MDC_CONC_HB	MDC_EVT_HI	phys high thr	Hemoglobin High	Notification that patient hemoglobin has risen above limit.	O
MDC_CONC_HB	MDC_EVT_LO	phys low thr	Hemoglobin Low	Notification that patient hemoglobin has fallen below limit.	O
MDC_HDIALY_REL_BLOOD_VOL	MDC_EVT_LO	phys low thr	Blood Volume	Notification that the relative blood volume has dropped below the defined setting	O
MDC_SAT_O2	MDC_EVT_HI	phys high thr	Oxygen Saturation High	Notification that Patient Oxygen Saturation has risen above limit.	O
MDC_SAT_O2	MDC_EVT_LO	phys low thr	Oxygen Saturation Low	Notification that Patient Oxygen Saturation has fallen below limit.	O

Notes

1) In the case where the Event Identified is MDC_EVT_LO or MDC_EVT_HI, the dialysis machine will report the value of the parameter that is out of bounds in OBX-2 in the second observation. The parameter that is reported is shown in the Source Identifier column. The limit/range that is violated is reported in OBX-7 in the second observation.

Appendix A – HL7 Batch Protocol

In order to capture an entire dialysis machine treatment, the HL7 Batch Protocol should be used. This protocol combines a series of intact MSH messages into a single message. The Batch Protocol preserves the content of the original PCD-01 DEC MSH messages. Although they are not requireed the manufacturer may include the ACK messages in the batch.

Segment	Meaning	Use	Card
[FHS]	File Header Segment	R	[1..1]
{	Batch Begin		
[BHS]	Batch Header Segment	R	[1..1]
{ [	Message begin		
MSH	One or more HL7 Messages	R	[1..N]
...			
...			
] }	MESSAGE end	R	[1..1]
[BTS]	Batch Trailer Segment	R	[1..1]
[FTS]	File Trailer Segment	R	[1..1]

A.1 Segments

A.1.1 BHS – Batch Header Segment

The BHS segment defines the start of a batch.

HL7 Attribute Table - BHS Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	ST	R		Batch Field Separator
2	ST	R		Batch Encoding Characters
3	HD	R		Batch Sending Application
4	HD	O		Batch Sending Facility
5	HD	O		Batch Receiving Application
6	HD	O		Batch Receiving Facility
7	DTM	O		Batch Date/Time of Message
8	ST	O		Batch Security
9	ST	O		Batch Name/ID/Type
10	ST	O		Batch Comment
11	ST	O		Batch Control ID
12	ST	O		Reference Batch Control ID
13	HD	O		Batch Sending Network Address
14	HD	O		Batch Receiving Network Address

This standard does not change any field definitions from the HL7 Standard.

BHS-3 Batch Sending Application

This Standard: This value is the same as the MSH-3 of the observations.

A.1.2 BTS – Batch Trailer Segment

The BTS segment defines the end of a batch.

HL7 Attribute Table - BTS Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	ST	O		Batch Message Count
2	ST	O		Batch Comments
3	NM	X		Batch Totals

BTS-3 Batch Totals (NM)

HL7 Definitions: We encourage new users of this field to use the HL7 Version 2.3 data type of NM and to define it as "repeating." This field contains the batch total. If more than a single batch total exists, this field may be repeated.

This Standard: The dialysis machines do not use the batch totals as this information is already conveyed by observation data.

A.1.3 FHS – File Header Segment

The FHS segment is used to head a file (group of batches).

HL7 Attribute Table - FHS Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	ST	R		File Field Separator
2	ST	R		File Encoding Characters
3	HD	R		File Sending Application
4	HD	O		File Sending Facility
5	HD	O		File Receiving Application
6	HD	O		File Receiving Facility
7	DTM	O		File Creation Date/Time
8	ST	O		File Security
9	ST	O		File Name/ID
10	ST	O		File Comment
11	ST	O		File Control ID
12	ST	O		Reference File Control ID
13	HD	O		File Sending Network Address
14	HD	O		File Receiving Network Address

This standard does not change any field definitions from the HL7 Standard.

FHS-3 File Sending Application

This Standard: This value is the same as the MSH-3 of the observations.

A.1.4 FTS – File Trailer Segment

The FTS segment defines the end of a file.

HL7 Attribute Table - FHS Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	ST	O		File Batch Count
2	ST	O		File Trailer Comments

This standard does not change any field definitions from the HL7 Standard.