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7 **Dialysis Machine HL7 Implementation**

8 **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
3.1	Expanded Patient Identification Section to include IHE PDQ Transaction. Added Prescription Transfer Section. Added Prescription Objects Added Usage Column for all objects.	January 2023
4.0	Added Message Transport section. Added note to alarm limit range report that limits can be fixed or machine generated.	March 2023

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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 covers the reporting of acute and chronic hemodialysis treatments to the EMR and the receipt of hemodialysis prescription information from the EMR. This specification does NOT cover peritoneal dialysis.

## 1.4 Assumptions

This document assumes that the user is familiar with the HL7 v2.6 standard as well as the IHE PCD and IHE ITI specifications.

## 1.5 Conventions

This specification is primarily based on the Integrating the Healthcare Enterprise (IHE), Patient Care Device (PCD) technical framework and IT Infrastructure (ITI) 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.
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 PCD 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.

The IHE IT Integration Technical Framework identifies a subset of the functional components of the healthcare enterprise, called IHE actors, and specifies their interactions in terms of a set of coordinated, standards-based transactions. The Framework offers a common language that healthcare professionals and vendors can use to discuss integration needs of healthcare enterprises and the integration capabilities of information systems in precise terms. Integration Profiles specify implementations of standards that are designed to meet identified clinical needs.

This implementation guide uses the IHE Patient Demographics Query (PDQ) for retrieving information about the dialysis patient. The information includes first name, last name, date of birth, gender, and medical record number. This information is used when requesting prescription information from the EMR.

This implementation guide creates a new query based upon the HL7 Query By Parameter/Segment Pattern Response model. The dialysis machine sends patient identifying information to the EMR which in turn responds with parameters needed to perform the dialysis treatment specific to the patient.

## 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 – Semantic 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



Ref	Title
[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

244

## 245 1.7 Glossary

246 **DEV:** An IHE domain formed to address the integration of medical devices into the healthcare  
247 enterprise.

248 **DOC:** Device Observation Consumer

249 **DOR:** Device Observation Reporter

250 **IHE:** Integrating the Healthcare Enterprise – An initiative by healthcare professionals and industry to  
251 improve the way computer systems in healthcare share information.

252 **ITI:** Information Technology Infrastructure

253 **MDS: Medical Device System**

254 **MDC: Medical Device Communications**

255 **MLLP:** Minimal Lower Layer Protocol – is used for transferring HL7 messages over Ethernet. It  
256 defines delimiters which identify the beginning and ends of the HL7 message.

257 **MRN:** Medical Record Number

258 **PCD:** Patient Care Device – An IHE DEV Program formed to address the integration of medical  
259 devices into the healthcare enterprise.

260 **VMD:** Virtual Medical Device

261 **UOM:** Unit of Measure

262 **CARD:** Cardinality

263

## 264 2 Time Synchronization

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

## 269 3 Message Transport

270 It is not the intent of this standard to specify the manner in which messages are transported.

271 That said, the default and minimal transport for messages is the HL7 defined “Minimum Lower Layer Protocol” (MLLP)  
272 for sending unencrypted HL7 messages over a TCP/IP connection without additional security provisions. MLLP is widely  
273 used at IHE Connectathons and other test venues. It is frequently used for “behind the hospital firewall” Local Area  
274 Network (LAN) installations or when using Virtual Private Networks (VPNs) or other security solutions provided by the  
275 vendor, customer or third party solution over public networks.

276 There are other means that could be used for transferring messages. Regardless of the transport method, it is critical  
277 that security considerations be taken into account.

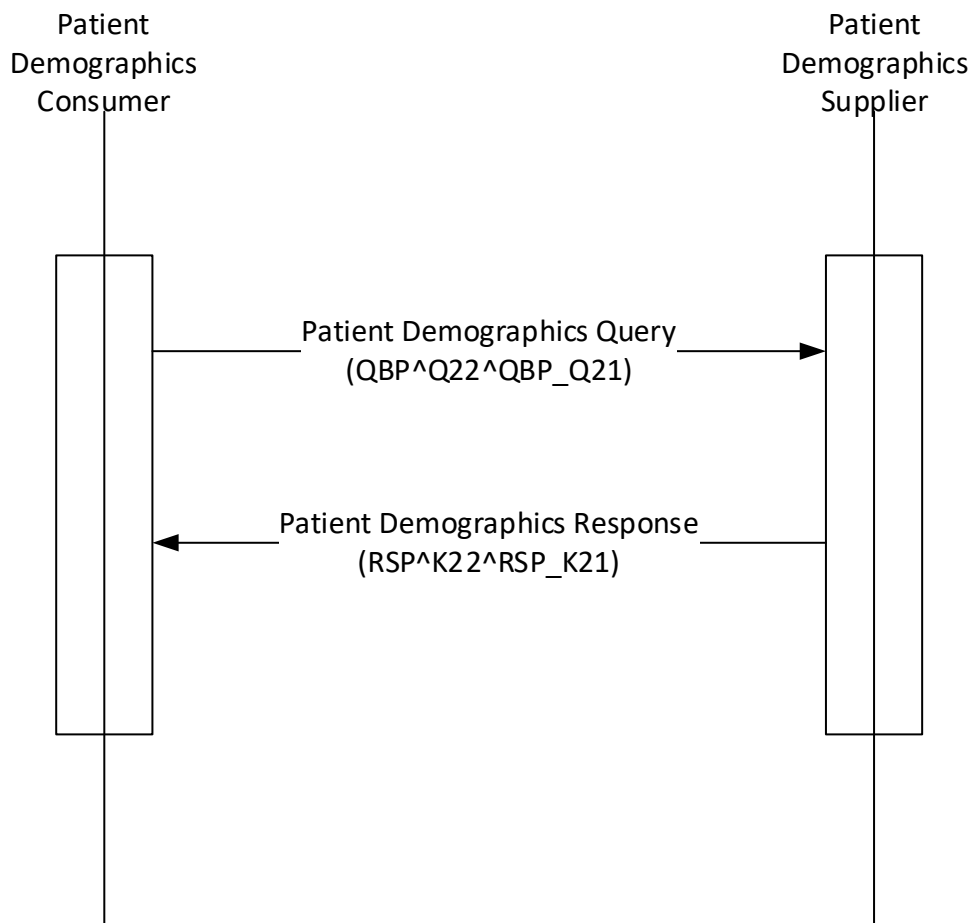
278

## 4 Patient Identification

### 4.1 Overview

Patient Identification is perhaps the most essential infrastructural component of any interoperability and communication process, particularly when prescriptions are downloaded from the EMR. 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 a unique Patient Identification. Other mechanisms such as bar code or RFID are also valid alternatives or complements. Examples of Patient Identifiers include Medical Record Number (MR), Person Number (PN), and Social Security Number (SS).

**Figure 1 – Patient Demographics Query [ITI-21]**



There are 6 use cases that are specifically identified.

#### Case #1 – Patient Identifier Scanned by Dialysis Machine from Wrist Band

In the case where the Dialysis Machine can scan the Patient Identifier from a wrist band then no further verification activities are needed. This is based on the precedent set by infusion pump manufacturers.

#### Case #2 – Patient Identifier Scanned from Something other than Wrist Band

There may be cases where some other means of obtaining the Patient Identifier is performed. An example would be an ID card contain a photo of the patient and a barcode containing the Patient Identifier. In this case, the caregiver can verify the link between the artifact used to identify the patient. If this link can be established,

then the scanned Patient Identifier could be used with no further verification.

#### Case #3 – Patient Demographics Loaded from External Device

In this case the patient demographics are loaded from some external device such as a memory card or USB stick. Once the demographics are loaded, this use case is identical to the one in which demographics are manually entered by the caregiver.

#### Case #4 – Patient Identifier Manually Entered by Caregiver

In the case where the care giver enters the Patient Identifier into the machine manually, the system must verify that no mistake was made. In this case the dialysis machine uses a PDQ transaction to get the demographics information, first name, last name, gender, and data of birth, from the EMR. The dialysis machine displays this information to the user so that they can confirm that the entered Patient Identifier matches the patient.

#### Case #5 – Patient Demographics Manually Entered by Care Giver

In the case where no Patient Identifier is known, the care giver manually enters the first name, last name, gender, and date of birth. This information is sent to the EMR in a PDQ transaction. The EMR returns a list of matching patients. The user must choose from this list of patients to get the correct Patient Identifier.

#### Case #6 – No Patient Demographics or Patient Identifier are Available

If no information is available to identify the patient, then the dialysis machine will report the Machine Model and Serial Number as the Patient Identifier. If this is done, then the patient prescription cannot be loaded from the EMR.

## 4.2 Message Structure

### 4.2.1 Patient Demographics Query

In the Patient Demographics Query, the Dialysis Machine provides the search criteria for the desired patient.

Segment	Meaning	Use	Card
MSH	Message Header	R	[1..1]
QPD	Query Parameter Definition	R	[1..1]
RCP	Response Control Parameters	R	[1..1]
[DSC]	Continuation Pointer	X	[0..0]

The dialysis machine use of this message does not deviate from the IHE Standard.

For simplicity, this implementation guide specifies use of a Single Domain Patient Demographics Supplier (See IHE ITI Technical Framework Vol 2x, Appendix M). Therefore, Receiving Application (MSH-5) and Receiving Facility (MSH-6) are left blank.

### 4.2.2 Patient Demographics Response

The EMR replies to the Patient Demographics Request with a Patient Demographics Response. This message will contain 0 or more PIDs segments containing information about the patients matching the criteria specified in the query.

Segment	Meaning	Use	Card
MSH	Message Header	R	[1..1]
MSA	Message Acknowledgment	R	[1..1]
[ {ERR} ]	Error		
QAK	Query Acknowledge	R	[1..1]
QPD	Query Parameter Definition	R	[1..1]

Segment	Meaning	Use	Card
[ {		O	[0..1]
PID	Patient Identifier	O	[0..1]
[PD1]			
[QRI]			
} ]			
[DSC]	Continuation Pointer	X	[0..0]

The dialysis machine use of this message does not deviate from the IHE Standard.

Upon receiving the response, the dialysis machine shall verify the following items:

- The Control ID (MSA-2) in the response matches the Control ID (MSH-10) in the request
- The Query Tag (QAK-1) in the response matches the Query Tag (QPD-2) in the request.
- The Query Name (QAK-3) in the response matches the Query Name (QPD-1) in the request.
- If the dialysis machine does not support continuation, then Hits Remaining (QAK-6) in the response must be 0.

## 4.3 Sample Messages

### 4.3.1 Example 1 – Query using Medical Record Number

The query is for the patient with a medical record number of 555444222111.

```
MSH|^~\&|ACME Dialysis Machine^00059AFFFE3C7A00^EUI-
64|||202204120831230000||QBP^Q22^QBP_Q21|20220412083123173|P|2.6||AL|NE||||
QPD|IHE_PDQ_Query|20220412083123174|@PID.3^555444222111^^^MR
RCP|I||R|
```

### 4.3.2 Example 2 – Query Response with No Matches

This response to the query for medical record number 555444222111 returns no data.

```
MSH|^~\&|ACME Dialysis Machine^00059AFFFE3C7A00^EUI-
64||202204120831230000||RSP^K22^RSP_K21|20220412083123174|P|2.6||NE|NE||||
MSA|AA|20220412083123173
QAK|20220412083123174|NF|IHE_PDQ_Query|0|0|0
QPD|IHE_PDQ_Query|20220412083123174|@PID.3^555444222111^^^MR
```

### 4.3.3 Example 3 – Query using First Name and Last Name

The query is for patient John Smith.

```
MSH|^~\&|ACME Dialysis Machine^00059AFFFE3C7A00^EUI-
64|||202204120831230000||QBP^Q22^QBP_Q21|20220412083123138|P|2.6||AL|NE||||
QPD|IHE_PDQ_Query|20220412083123153|@PID.5.1^Smith~@PID.5.2^John
RCP|I||R|
```

### 4.3.4 Example 4 – Query Response with Multiple Matches

This request for all patients named John Smith returns two patients, one born in 1964 and the other in 2000.

```
MSH|^~\&|ACME Dialysis Machine^00059AFFFE3C7A00^EUI-
64||202204120831230000||RSP^K22^RSP_K21|20220412083123170|P|2.6||NE|NE||||
MSA|AA|20220412083123138
QAK|20220412083123153|OK|IHE_PDQ_Query|2|2|0
```

363 QPD|IHE PDQ Query|20220412083123153|@PID.5.1^Smith~@PID.5.2^John  
 364 PID|||555444222111^^^MR||Smith^John^^^^U||19640306  
 365 PID|||555444999999^^^MR||Smith^John^^^^U||02000921

### 4.3.5 Example 5 – Query using Person Number

366 The query is for the patient with a person number of 010199-000H.

367 MSH|^~\&|ACME Dialysis Machine^00059AFFFE3C7A00^EUI-  
 368 64|||202204120831230000||QBP^Q22^QBP\_Q21|20220412083123173|P|2.6||AL|NE|||  
 369 QPD|IHE PDQ Query|20220412083123174|@PID.3^010199-000H^^^^PN  
 370 RCP|I||R|

## 5 Prescription Transfer

### 5.1 Overview

374 Prescription information is retrieved from the EMR using a custom query that aligns with the HL7 Query By  
 375 Parameter with a Segment Pattern Response (QBP/RSP). The dialysis machine provides the patient’s MRN and the  
 376 EMR returns a series of OBX records containing the parameters that define the therapy. The parameters in the  
 377 response are grouped hierarchically following the containment model defined in Section 9.3. Which parameters  
 378 may be returned are defined by the Rx Use column in Table 2 – Dialysis Machine Data Objects.

379 Although it is unlikely, it is possible that a patient may have more than one active prescription in the EMR. This  
 380 could occur when a patient that normally performs dialysis in a home setting is admitted to the hospital for some  
 381 condition. In this case, the hospital prescription could be different than the home prescription. The dialysis machine  
 382 expects the EMR to send back one and only-one prescription. It is up to the EMR to decide what is the appropriate  
 383 prescription to send to the dialysis machine. If the EMR is unable to select a single prescription it should send back  
 384 and error code in the Dialysis Prescription Response’s ERR Segment.

385 Any setting value that is sent from the EMR to the Dialysis Machine will be sent back in the PCD-01 messages. If the  
 386 value remains unchanged from the value sent from the EMR, the setting will be identified as a Remote Setting  
 387 (RSET) in the corresponding OBX-17 field. If a value is changed by the user, this field will change to Manual Setting  
 388 (MSET). If the setting changes because of internal algorithms within the Dialysis Machine, the OBX-17 field will be  
 389 Automatic Setting (ASET). Once a remote setting changes to a manual or automatic setting, it will not return to a  
 390 remote setting even if the user or system returns it to its original value.

### 5.2 Message Structure

#### 5.2.1 Dialysis Prescription Query

393 The dialysis prescription query is used by the dialysis machine to request a prescription for a particular MRN  
 394 from the EMR.

Segment	Meaning	Use	Card
MSH	Message Header	R	[1..1]
QPD	Query Parameter Definition	R	[1..1]
RCP	Response Control Parameters	R	[1..1]
[DSC]	Continuation Pointer	X	[0..0]

#### QPD-1 Message Query Name

397 The name of the query shall be the CWE "MDC\_HDIALY\_RX\_QUERY^Hemodialysis Prescription Query^MDC".  
 398 The EMR system copies this value into the QAK-3 filed in the response.

**QPD-2 Query Tag**

The dialysis machine will populate the Query Tag field with an identifier that uniquely identifies this query for the dialysis machine. It does not need to be globally unique. A simple method would be to use a timestamp in the format of "YYYYMMDDHHMMSSZZZ" where "ZZZ" is milliseconds. Assuming no more than one query is sent every millisecond this format will result in a unique value. The EMR system copies this value in to the QAK-1 field in the response.

**QPD-3 User Parameters**

The Dialysis Prescription Query specifies parameters in the same manner as the IHE PDQ message. Initially, only the MRN field will be include but using this format allows for future expansion.

**5.2.2 Dialysis Prescription Response**

The EMR response to a Dialysis Prescription Query with a Dialysis Prescription Response. The response contains the current prescription for the patient with the MRN specified in the query.

Segment	Meaning	Use	Card
MSH	Message Header	R	[1..1]
MSA	Message Acknowledgment	R	[1..1]
[ {ERR} ]	Error		
QAK	Query Acknowledge	R	[1..1]
QPD	Query Parameter Definition	R	[1..1]
[ {		O	[0..1]
ORC	Common Order Segment	O	[0..1]
OBX	Observation Results	O	[0..N]
} ]			
[DSC]	Continuation Pointer	X	[0..0]

Upon receiving the response, the dialysis machine shall verify the following items:

- The Control ID (MSA-2) in the response matches the Control ID (MSH-10) in the request
- The Query Tag (QAK-1) in the response matches the Query Tag (QPD-2) in the request.
- The Query Name (QAK-3) in the response matches the Query Name (QPD-1) in the request.
- The MRN (QPD-3) in the response matches the MRN (QPD-3) in the request.

In cases where the dialysis machine receives a valid Dialysis Prescription Response, but the machine is unable to meet all of the parameters contained in the response, the dialysis machine has several options.

Option 1 – The dialysis machine may discard the prescription in its entirety. Either the treatment is not performed, or the caregiver manually enters the prescription. This is no different than performing a treatment without requesting the prescription. In this case, the Filler Order Number (OBR-3) reported in the PCD-01 Status Messages will be empty.

Option 2 – The caregiver can use the Ordering Provider (ORC-12) or Call back Phone Number (ORC-14) to request an updated prescription. In this case, the treatment is delayed. The Filler Order Number (OBR-3) reported and setting parameters in the PCD-01 Status message will match the Filler Order Number (ORC-3) and parameters specified in the Dialysis Prescription Response.

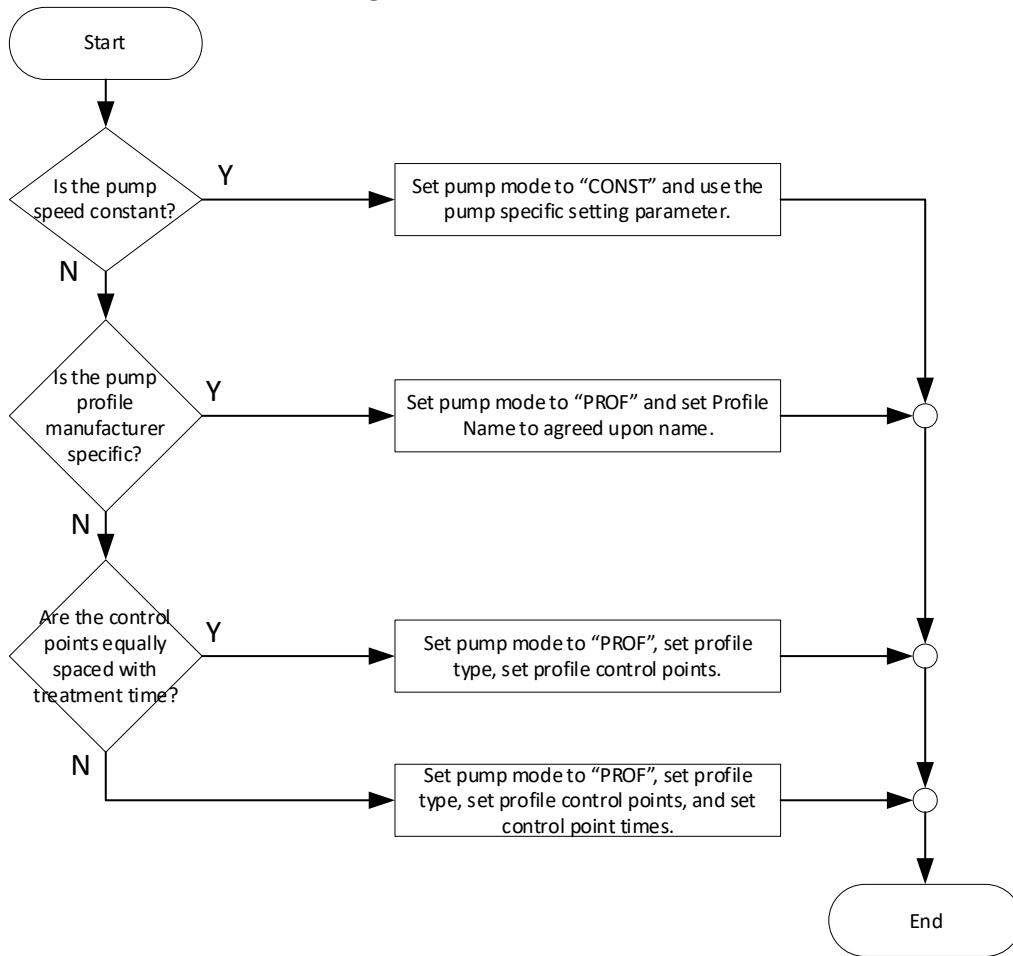
Option 3 – The caregiver can accept the parameters from the prescription that can be performed by the dialysis machine. They can manually override parameters that do not align with the specific dialysis machine. In this case, the Filler Order Number (OBR-3) in the PCD-01 Status message will match Filler

Order Number (ORC-3) in the Dialysis Prescription Response but the setting parameters may differ.

### 5.3 Profile Representation

Dialysis machines support two modes of pump operation, constant speed and profiled speed. For constant speed, the pump always runs at the same speed when it is running. For profiled speed, the speed of the pump changes depending on phase of the treatment. The mechanism used to transfer the prescription from the EMR to the dialysis machines needs to support both modes of operation.

Figure 2 –Profile Flow Chart



The following table identifies the possible profiles in a prescription.

Pump	Mode Parameter	Constant Speed Parameter
Blood	N/A because blood pump does not support profiled speed.	MDC_HDIALY_BLD_PUMP_BLOOD_FLOW_RATE_SETTING
Dialysate	MDC_HDIALY_DIALYSATE_FLOW_MODE	MDC_HDIALY_DIALYSATE_FLOW_RATE_SETTING
Post-Filter Substitution (RF) Fluid	MDC_HDIALY_RF_FLOW_MODE	MDC_HDIALY_RF_POST_FILTER_FLOW_RATE_SETTING
Pre-Filter Substitution (RF) Fluid	MDC_HDIALY_RF_FLOW_MODE	MDC_HDIALY_RF_PRE_FILTER_FLOW_RATE_SETTING

Pump	Mode Parameter	Constant Speed Parameter
Ultra Filtration	MDC_HDIALY_UF_MODE	MDC_HDIALY_UF_RATE_SETTING
Anticoagulant	MDC_HDIALY_ANTICOAG_MODE	MDC_HDIALY_ANTICOAG_INFUS_RATE_SETTING
Sodium	MDC_HDIALY_DIALYSATE_CONC_NA_MODE	MDC_HDIALY_DIALYSATE_CONC_NA_SETTING

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The dialysis machine can represent two types of profiles. The first is a manufacturer specific profile. In this type of profile, the details of the profile are specific to a particular manufacturer. The second type of profile is a generic profile. The Implementation Guide supports 4 type of generic profiles, Constant, Linear, Exponential, and Step. For a generic profile the parameters of the profile are specified as Facet Level 5 objects of the Mode Parameter.

ID	Object Name	Description
1	MDC_HDIALY_PROFILE_TYPE	Contains the type of the profile. This will be VENDOR, CONSTANT, LINEAR, EXPONENTIAL, or STEP.
2	MDC_HDIALY_PROFILE_VALUE	Contains the control points of the profile. The control points are a numeric array. For a constant profile there is only one point. For a linear or exponential profile there are two points, one for the starting value and one for the ending value. For step profile there is one value for each step.
3	MDC_HDIALY_PROFILE_TIME	This parameter is optional. If it is not present, the control points are assumed to be equally space across the total treatment time. If it is present, it is an array of numerical values that are the treatment times at which a control point takes effect.
4	MDC_HDIALY_PROFILE_EXP_HALF_TIME	This parameter is optional and only applies to the Exponential Profile. It specifies the time at which 50% of the change has been complete.
5	MDC_HDIALY_PROFILE_NAME	This parameter is optional and only applies to the Vendor Profile. It uniquely identifies the profile.

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### 5.3.1 Vendor Profile

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In Vendor Profile, the details of the profile are specific to a particular manufacturer. The profile is identified using the MDC\_HDIALY\_PROFILE\_NAME object and consists of three component, Manufacturer, Model, and Name. The Manufacturer is a string that uniquely identifies the maker of the dialysis machine. Model is the model of the dialysis machine. If the profile is universal across a manufacturer's product line, then this field may be left blank. For example, "FMC^^Profile 1" or "NxStage^SystemOne^Gentle". It is the manufacturer's responsibility to make sure that these profile identifiers are compatible or unique across device models and software versions. When a manufacturer specific profile is used, it is imperative that this profile be clearly defined. The best way of accomplishing this is by defining the profile in the device's instructions for use.



The segments below represent a B-Braun Dialog+ UF Profile 2. Note, to profile name is provided for example only and may not represent an actual profile.

```
OBX|66|ST|158619^MDC_HDIALY_UF_MODE^MDC|1.1.4.27|PRO-WOT|||||F
```

```
OBX|67|ST|0^MDC_HDIALY_PROFILE_TYPE^MDC|1.1.4.27.1|VENDOR|||||F
```

```
OBX|68|NA|0^MDC_HDIALY_PROFILE_NAME^MDC|1.1.4.27.2|BBRAUN^DIALOGPLUS^UF1|||||F
```

### 5.3.2 Constant Profile

A constant profile starts at one level and stays at this level for the course of the treatment. A constant profile could also be represented as a linear or exponential profile where the starting and ending values are the same or as step profile with only a single step.

**Figure 3 – Constant Profile**



The segments below represent a constant UF profile of 10 ml/hour.

```
OBX|66|ST|158619^MDC_HDIALY_UF_MODE^MDC|1.1.4.27|PRO-WOT|||||F
```

```
OBX|67|ST|0^MDC_HDIALY_PROFILE_TYPE^MDC|1.1.4.27.1|CONSTANT|||||F
```

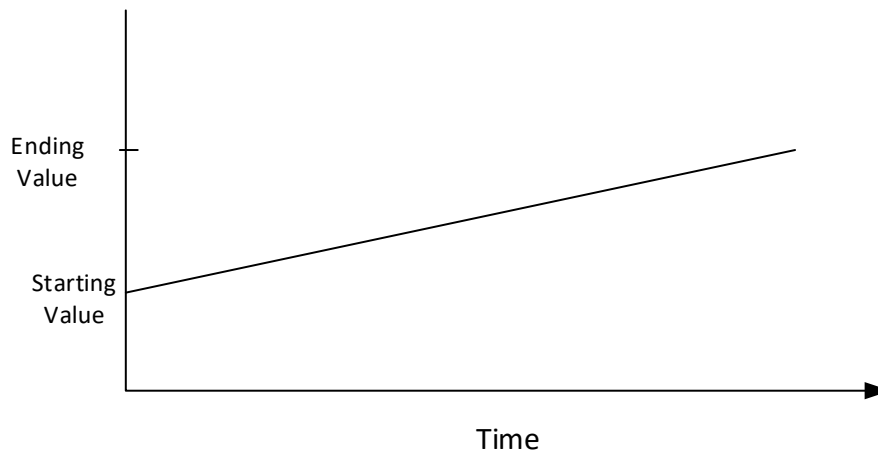
```
OBX|68|NA|0^MDC_HDIALY_PROFILE_VALUE^MDC|1.1.4.27.2|10|ml/h^milliliter per|||||F
```

### 5.3.3 Linear Profile

A linear profile starts at one level and linearly changes to another level.

476

Figure 4 –Linear Profile



477

478

The segments below define a linear profile that starts at 10 ml/hour and ends at 60 ml/hour.

479

```
OBX|66|ST|158619^MDC_HDIALY_UF_MODE^MDC|1.1.4.27|PRO-WOT|||||F
```

480

```
OBX|67|ST|0^MDC_HDIALY_PROFILE_TYPE^MDC|1.1.4.27.1|LINEAR|||||F
```

481

482

```
OBX|68|NA|0^MDC_HDIALY_PROFILE_VALUE^MDC|1.1.4.27.2|10^30|ml/h^milliliter per  
hour^UCUM|||||F
```

483

### 5.3.4 Exponential Profile

484

485

An exponential profile starts at one level and exponentially transitions to another level. The general equation for the exponential curve is

486

$$y=(A-B) e^{-kt} + B$$

487

The standard has three different ways of specifying the time constant,  $k$ .

488

489

490

- 1) The time constant can be specified by specifying the Half Time,  $T_{\text{half}}$ , of the change using the MDC\_HDIALY\_PROFILE\_EXP\_HALF\_TIME. This value is the time at which 50% of the change has been completed. In this case,  $k$  is  $0.693/T_{\text{half}}$ .

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492

- 2) If a time is specified using MDC\_HDIALY\_PROFILE\_TIME, then the standard defines this time as the point when 99.7% of the change has been completed. In this case,  $k$  is  $0.003/T$ .

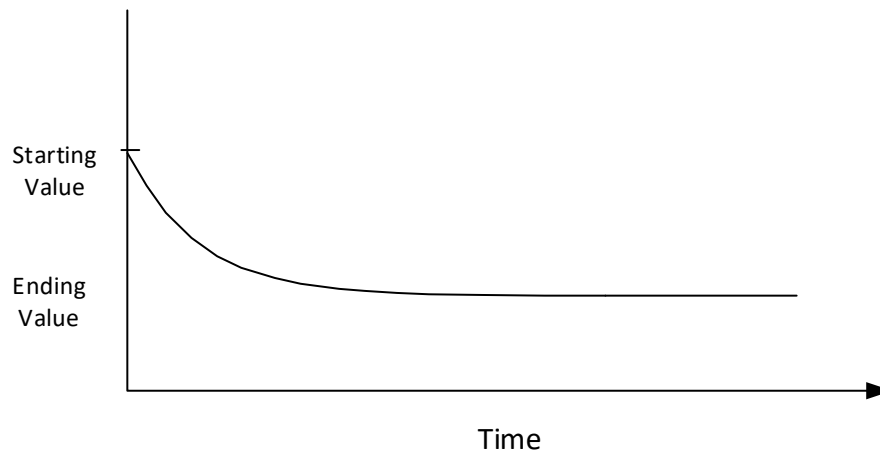
493

494

495

- 3) If neither MDC\_HDIALY\_PROFILE\_TIME nor MDC\_HDIALY\_EXP\_HALF\_TIME is used, then the curve will be computed assuming that 99.7% of the change is completed at the end of the treatment. In this case  $k$  is  $0.003/T_{\text{tx}}$ .

496

**Figure 5 – Exponential Profile**

497

498

499 The segments below define a profile that starts at 30 ml/hr and reaches 10 ml/hour after 60 minutes. The  
500 transition between these two points is exponential.

501

```
OBX|66|ST|158619^MDC_HDIALY_UF_MODE^MDC|1.1.4.27|PRO-WOT|||||F
```

502

```
OBX|67|ST|0^MDC_HDIALY_PROFILE_TYPE^MDC|1.1.4.27.1|EXPONENTIAL|||||F
```

503

504

```
OBX|68|NA|0^MDC_HDIALY_PROFILE_VALUE^MDC|1.1.4.27.2|30^10|ml/h^milliliter per  
hour^UCUM|||||F
```

505

```
OBX|69|NA|0^MDC_HDIALY_PROFILE_TIME^MDC|1.1.4.27.3|0^60.0|min^minutes^UCUM|||||F
```

506

507

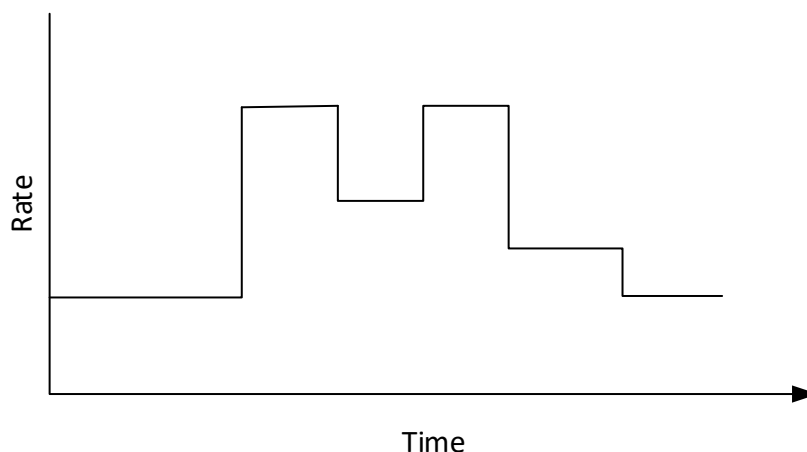
### 5.3.5 Step Profile

508

509

A step profile contains one of more discrete values. Each value is run for a specific amount of time before switching to the next value.

510

**Figure 6 – Step Profile**

511

512

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514

The segments below define a Step Profile with three steps. It starts at 10 ml/hr. At Tx Time of 30 minutes, it changes to 20 ml/hr. At Tx Time of 60 minutes, it changes to 30 ml/hr. The rate remains at 30 ml/hr for remainder of treatment.

515

```
OBX|66|ST|158619^MDC_HDIALY_UF_MODE^MDC|1.1.4.27|PRO-WOT|||||F
```

516 OBX|67|ST|0^MDC\_HDIALY\_PROFILE\_TYPE^MDC|1.1.4.27.1|STEP|||||F  
 517 OBX|68|NA|0^MDC\_HDIALY\_PROFILE\_VALUE^MDC|1.1.4.27.2|10^20^30|ml/h^milliliter per  
 518 hour^UCUM|||||F  
 519 OBX|69|NA|0^MDC\_HDIALY\_PROFILE\_TIME^MDC|1.1.4.27.3|0^30.0^60.0|min^minutes^UCUM|||||F  
 520

## 521 5.4 Sample Messages

### 522 5.4.1 Example 1 – Prescription Request

523 The following message requests the prescription for the patient with medical record number 555444222111.

524 MSH|^~\&|ACME\_Dialysis\_Machine^00059AFFFE3C7A00^EUI-  
 525 64|||||20220330125317+0000||QBP^D01^QBP\_D01|PQ20211216144700|P|2.6|||AL|NE|||||  
 526 QPD|0^MDC\_HDIALY\_RX\_QUERY^MDC|Q001|@PID.3^555444222111^^^MR  
 527 RCP|I||R|

### 528 5.4.2 Example 2 – Prescription Response

529 The following message is the prescription for patient 555444222111. The therapy is HD using RFP-204 bagged  
 530 dialysate. Blood flow rate is 250 ml/min, Dialysate Flow Rate is 120 ml/min, UF Rate is 400 ml/hr, and the  
 531 weight to remove is 1 L.

532 MSH|^~\&|ACME\_Dialysis\_Machine^00059AFFFE3C7A00^EUI-  
 533 64|||||20220330125317+0000||RSP^K22^RSP\_K21|20220330125317627|P|2.6|||AL|NE|||||  
 534 MSA|AA|PQ20211216144700  
 535 QAK|Q001|OK|0^MDC\_HDIALY\_RX\_QUERY^MDC|1|1|0  
 536 QPD|0^MDC\_HDIALY\_RX\_QUERY^MDC|Q001|@PID.3^555444222111^^^MR  
 537 OBC|NW|A226677^PC|||||N||||444-44-4444^HIPPOCRATES^HAROLD^^^MD  
 538 OBX|1|ST|70929^MDC\_DEV\_HDIALY\_MACHINE\_MDS^MDC|1|||||F  
 539 OBX|2|ST|70934^MDC\_DEV\_HDIALY\_VMD^MDC|1.1|||||F  
 540 OBX|3|ST|70939^MDC\_DEV\_HDIALY\_MACH\_CONFIG\_CHAN^MDC|1.1.1|||||F  
 541 OBX|4|ST|158598^MDC\_HDIALY\_MACH\_TX\_MODALITY^MDC|1.1.1.1|HD|||||F  
 542 OBX|5|ST|70967^MDC\_DEV\_HDIALY\_THERAPY\_OUTCOMES\_CHAN^MDC|1.1.2|||||F  
 543 OBX|6|ST|158618^MDC\_HDIALY\_THERAPY\_COMPLETE\_METHOD^MDC|1.1.2.1|UF|||||F  
 544 OBX|7|ST|70947^MDC\_DEV\_HDIALY\_BLOOD\_PUMP\_CHAN^MDC|1.1.3|||||F  
 545 OBX|8|NM|16935956^MDC\_HDIALY\_BLD\_PUMP\_BLOOD\_FLOW\_RATE\_SETTING^MDC|1.1.3.1|250|ml/min^ml/min  
 546 ^UCUM|||||F  
 547 OBX|9|ST|158604^MDC\_HDIALY\_BLD\_PUMP\_MODE^MDC|1.1.3.2|2N|||||F  
 548 OBX|10|ST|70951^MDC\_DEV\_HDIALY\_FLUID\_CHAN^MDC|1.1.4|||||F  
 549 OBX|11|ST|158606^MDC\_HDIALY\_DIALYSATE\_FLOW\_MODE^MDC|1.1.4.1|CONST|||||F  
 550 OBX|12|NM|16936008^MDC\_HDIALY\_DIALYSATE\_FLOW\_RATE\_SETTING^MDC|1.1.4.2|120|ml/min^ml/min^UCU  
 551 M|||||F  
 552 OBX|13|NM|0^MDC\_HDIALY\_DIALYSATE\_VOL\_SETTING^MDC|1.1.4.3|25|L^L^UCUM|||||F  
 553 OBX|14|ST|158608^MDC\_HDIALY\_DIALYSATE\_NAME^MDC|1.1.4.4|RFP-204|||||F  
 554 OBX|15|ST|70971^MDC\_DEV\_HDIALY\_UF\_CHAN^MDC|1.1.5|||||F  
 555 OBX|16|ST|158619^MDC\_HDIALY\_UF\_MODE^MDC|1.1.5.1|CONST-WT|||||F  
 556 OBX|17|NM|16936252^MDC\_HDIALY\_UF\_RATE\_SETTING^MDC|1.1.5.2|400|ml/h^ml/h^UCUM|||||F  
 557 OBX|18|NM|159028^MDC\_HDIALY\_UF\_TARGET\_VOL\_TO\_REMOVE^MDC|1.1.5.3|1000|ml^ml^UCUM|||||F

### 5.4.3 Example 2 – Prescription Response for HF Therapy with a Linear UF Profile

The following message is the prescription for patient 555444222111. The therapy is Pre-Filter HF using RFP-400 bagged dialysate. Blood flow rate is 250 ml/min, RF Flow Rate is 120 ml/min, UF Rate starts at 300 and decreases linearly to 100 ml/hr at end of treatment, and the weight to remove is 1 L.

```
MSH|^~\&|ACME_Dialysis_Machine^00059AFFFE3C7A00^EUI-
64|||20220330132820+0000||RSP^K22^RSP_K21|20220330132820292|P|2.6|||AL|NE|||
MSA|AA|PQ20211216144700
QAK|Q001|OK|0^MDC_HDIALY_RX_QUERY^MDC|1|1|0
QPD|0^MDC_HDIALY_RX_QUERY^MDC|Q001|@PID.3^555444222111^^^MR
OBC|NW|A226677^PC|||N|||444-44-4444^HIPPOCRATES^HAROLD^^^MD
OBX|1|ST|70929^MDC_DEV_HDIALY_MACHINE_MDS^MDC|1|1|1|1|1|1|1|F
OBX|2|ST|70934^MDC_DEV_HDIALY_VMD^MDC|1.1|1|1|1|1|1|F
OBX|3|ST|70939^MDC_DEV_HDIALY_MACH_CONFIG_CHAN^MDC|1.1.1|1|1|1|1|1|F
OBX|4|ST|158598^MDC_HDIALY_MACH_TX_MODALITY^MDC|1.1.1.1|HF|1|1|1|1|1|F
OBX|5|ST|70967^MDC_DEV_HDIALY_THERAPY_OUTCOMES_CHAN^MDC|1.1.2|1|1|1|1|1|F
OBX|6|ST|158618^MDC_HDIALY_THERAPY_COMPLETE_METHOD^MDC|1.1.2.1|UF|1|1|1|1|1|F
OBX|7|ST|70947^MDC_DEV_HDIALY_BLOOD_PUMP_CHAN^MDC|1.1.3|1|1|1|1|1|F
OBX|8|NM|16935956^MDC_HDIALY_BLD_PUMP_BLOOD_FLOW_RATE_SETTING^MDC|1.1.3.1|250|ml/min^ml/min
^UCUM|1|1|1|1|1|F
OBX|9|ST|158604^MDC_HDIALY_BLD_PUMP_MODE^MDC|1.1.3.2|2N|1|1|1|1|1|F
OBX|10|ST|70959^MDC_DEV_HDIALY_CONVECTIVE_CHAN^MDC|1.1.4|1|1|1|1|1|F
OBX|11|ST|158613^MDC_HDIALY_RF_DILUTION_LOCATION^MDC|1.1.4.1|PREF|1|1|1|1|1|F
OBX|12|NM|16936156^MDC_HDIALY_RF_PRE_FILTER_FLOW_RATE_SETTING^MDC|1.1.4.2|120|ml/min^ml/min
^UCUM|1|1|1|1|1|F
OBX|13|NM|16936164^MDC_HDIALY_RF_PRE_FILTER_VOL_SETTING^MDC|1.1.4.3|25|L^L^UCUM|1|1|1|1|1|F
OBX|14|ST|158615^MDC_HDIALY_RF_PRE_FILTER_NAME^MDC|1.1.4.4|RFP-400|1|1|1|1|1|F
OBX|15|ST|70971^MDC_DEV_HDIALY_UF_CHAN^MDC|1.1.5|1|1|1|1|1|F
OBX|16|ST|158619^MDC_HDIALY_UF_MODE^MDC|1.1.5.1|PRO-WT|1|1|1|1|1|F
OBX|17|ST|0^MDC_HDIALY_PROFILE_TYPE^MDC|1.1.5.1.1|LINEAR|1|1|1|1|1|F
OBX|18|ST|1^MDC_HDIALY_PROFILE_VALUE^MDC|1.1.5.1.2|300^100|ml/h^ml/h^UCUM|1|1|1|1|1|F
OBX|19|NM|159028^MDC_HDIALY_UF_TARGET_VOL_TO_REMOVE^MDC|1.1.5.2|1000|ml^ml^UCUM|1|1|1|1|1|F
```

### 5.4.4 Example 3 – Prescription Response returning No Prescription

The following message is returned by the EMR is there is no prescription associated with the requested MRN.

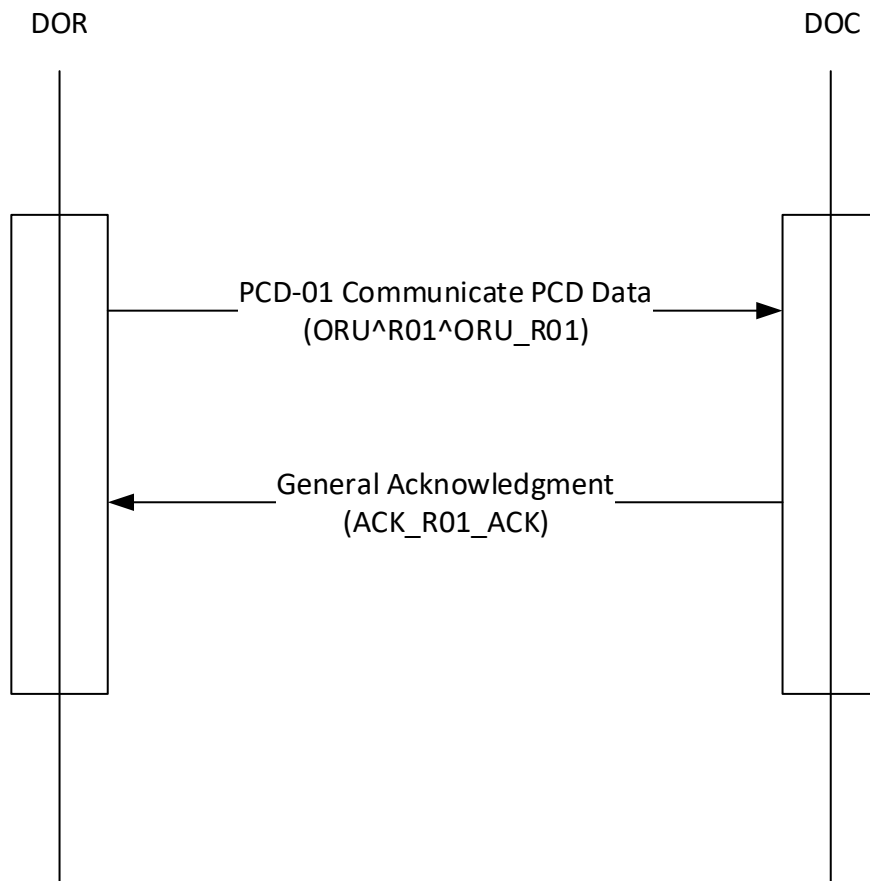
```
MSH|^~\&|ACME_Dialysis_Machine^00059AFFFE3C7A00^EUI-
64|||20220330125317+0000||RSP^K22^RSP_K21|20220330125317737|P|2.6|||AL|NE|||
MSA|AA|PQ20211216144700
QAK|Q001|NF|0^MDC_HDIALY_RX_QUERY^MDC|0|0|0
QPD|0^MDC_HDIALY_RX_QUERY^MDC|Q001|555444222111
```

## 6 Reporting Treatment Information

### 6.1 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 7 - 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 9 - 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 hierarchy must be maintained but ordering within a section can be change. The ordering in Table 2 – Dialysis Machine Data Objects does not prescribe a particular order

620 in the PCD-01 message.

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

## 623 6.2 Device Request

### 624 6.2.1 Message Structure

625 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		

Segment	Meaning	Use	Card
}	--- PATIENT_RESULT end		
[DSC]	Continuation Pointer	X	[0..0]

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## 6.2.2 Observation Results Structure

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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.

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## 6.2.3 Event Status

639

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

640

- True/False

641

- Start/Continue/End

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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.

648

649

Example, Blood Leak not detected

650

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

651

Example, Blood Leak detected

652

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

653

654

655

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658

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.

659

660

Example, Blood Leak detected

661

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

662

Example, Blood Leak ongoing

663

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

664

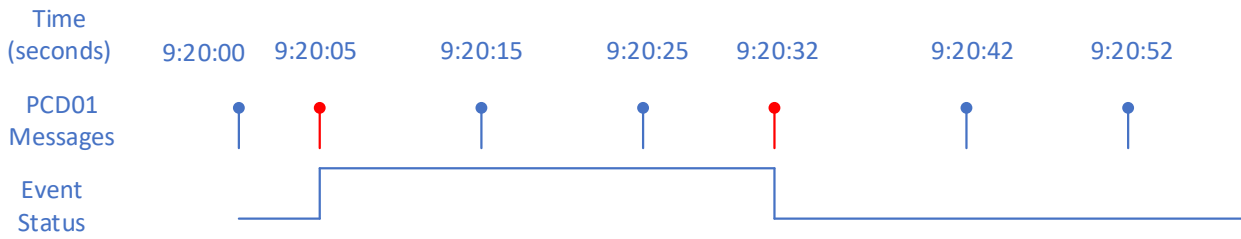
Example, Blood Leak done



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 8 – 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.

**6.2.4 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^1.3.6.1.4.1.19376.1.6.1.1.1^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^MDC|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^MDC|1.1|||||F
OBX|8|ST|70939^MDC_DEV_HDIALY_MACH_CONFIG_CHAN^MDC|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
```

**6.2.5 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^IHEPC
D^1.3.6.1.4.1.19376.1.6.1.1.1^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^MDC|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^MDC|1.1|||||F
OBX|8|ST|70939^MDC_DEV_HDIALY_MACH_CONFIG_CHAN^MDC|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|HD|||||F
OBX|14|NM|158720^MDC_HDIALY_MACH_THERAPY_TIME^MDC|1.1.1.10|180|min^min^UCUM|||||F
OBX|15|NM|158724^MDC_HDIALY_MACH_TIME_REMAIN^MDC|1.1.1.11|600|min^min^UCUM|||||F
OBX|16|ST|70947^MDC_DEV_HDIALY_BLOOD_PUMP_CHAN^MDC|1.1.3|||||F
OBX|17|NM|16935956^MDC_HDIALY_BLD_PUMP_BLOOD_FLOW_RATE_SETTING^MDC|1.1.3.2|250|ml/min^ml/min^UCU
M|||||F
OBX|18|NM|158744^MDC_HDIALY_BLD_PRESS_ART^MDC|1.1.3.4|-75|mm[Hg]^mm[Hg]^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]^mm[Hg]^UCUM|20-400|||||F
OBX|22|ST|70951^MDC_DEV_HDIALY_FLUID_CHAN^MDC|1.1.4|||||F
OBX|23|ST|158606^MDC_HDIALY_DIALYSATE_FLOW_MODE^MDC|1.1.4.1|CONST|||||F
OBX|24|NM|16936008^MDC_HDIALY_DIALYSATE_FLOW_RATE_SETTING^MDC|1.1.4.2|100|ml/min^ml/min^UCUM|
|F
OBX|25|NM|158792^MDC_HDIALY_DIALYSATE_FLOW_RATE^MDC|1.1.4.3|99|ml/min^ml/min^UCUM|||||F
OBX|26|NM|158788^MDC_HDIALY_DIALYSATE_COND^MDC|1.1.4.4|13.81|mS/cm^mS/cm^UCUM|||||F
OBX|27|ST|198244^MDC_EVT_HDIALY_BLOOD_LEAK^MDC|1.1.4.5|F|||||F
OBX|28|ST|70955^MDC_DEV_HDIALY_FILTER_CHAN^MDC|1.1.5|||||F
OBX|29|NM|158852^MDC_HDIALY_FILTER_TRANSMEMBRANE_PRESS^MDC|1.1.5.2|35|mm[Hg]^mm[Hg]^UCUM|||||F
OBX|30|ST|70963^MDC_DEV_HDIALY_SAFETY_SYSTEMS_CHAN^MDC|1.1.7|||||F
OBX|31|ST|198252^MDC_EVT_HDIALY_SAFETY_ART_AIR_DETECT^MDC|1.1.7.1|F|||||F
OBX|32|ST|198254^MDC_EVT_HDIALY_SAFETY_DIALYSATE_AIR_DETECT^MDC|1.1.7.2|F|||||F
OBX|33|ST|198258^MDC_EVT_HDIALY_SAFETY_SYSTEM_GENERAL^MDC|1.1.7.3|F|||||F
OBX|34|ST|198216^MDC_EVT_SELFTEST_FAILURE^MDC|1.1.7.4|F|||||F
OBX|35|ST|198262^MDC_EVT_HDIALY_SAFETY_VEN_AIR_DETECT^MDC|1.1.7.5|F|||||F
    
```

740 OBX|36|ST|70967^MDC\_DEV\_HDIALY\_THERAPY\_OUTCOMES\_CHAN^MDC|1.1.8|||||F  
 741 OBX|37|ST|158618^MDC\_DEV\_HDIALY\_THERAPY\_COMPLETE\_METHOD^MDC|1.1.8.18|UF|||||F  
 742 OBX|38|ST|70971^MDC\_DEV\_HDIALY\_UF\_CHAN^MDC|1.1.9|||||F  
 743 OBX|39|NM|159028^MDC\_DEV\_HDIALY\_UF\_TARGET\_VOL\_TO\_REMOVE^MDC|1.1.9.1|2000|ml^ml^UCUM|||||F  
 744 OBX|40|NM|159032^MDC\_DEV\_HDIALY\_UF\_ACTUAL\_REMOVED\_VOL^MDC|1.1.9.2|555|ml^ml^UCUM|||||F  
 745 OBX|41|ST|158619^MDC\_DEV\_HDIALY\_UF\_MODE^MDC|1.1.9.3|CONST-WT|||||F  
 746 OBX|42|NM|159036^MDC\_DEV\_HDIALY\_UF\_RATE^MDC|1.1.9.4|100|ml/h^ml/h^UCUM|||||F  
 747 OBX|43|NM|16936252^MDC\_DEV\_HDIALY\_UF\_RATE\_SETTING^MDC|1.1.9.5|100|ml/h^ml/h^UCUM|||||F  
 748 OBX|44|ST|198276^MDC\_EVT\_HDIALY\_UF\_RATE\_RANGE^MDC|1.1.9.6|F|||||F  
 749

## 6.2.6 Example 3 – Full Message

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

751 MSH|^~\&|ACME\_Dialysis\_Machine^080019FFFE3ED02D^EUI-  
 752 64|||||20191003092025+0000||ORU^R01^ORU\_R01|20191003092024|P|2.6|||AL|NE|||||IHE\_PCD\_001^IHEPC  
 753 D^1.3.6.1.4.1.19376.1.6.1.1.1^ISO  
 754 PID|||Scrubber 2000/SC678932^^^"^^U||^  
 755 OBR|1||080019FFFE3ED02D20110602045842^ACME\_Dialysis\_Machine^080019FFFE3ED02D^EUI-  
 756 64|70929^MDC\_DEV\_HDIALY\_MACHINE\_MDS^MDC|||20191003092024+0000  
 757 OBX|1|ST|70929^MDC\_DEV\_HDIALY\_MACHINE\_MDS^MDC|1.0.0|||||F  
 758 OBX|2|ST|67880^MDC\_ATTR\_ID\_MODEL^MDC|1.0.0.1|NxStage System One|||||F  
 759 OBX|3|ST|531970^MDC\_ID\_MODEL\_MANUFACTURER^MDC|1.0.0.2|NxStage|||||F  
 760 OBX|4|ST|531969^MDC\_ID\_MODEL\_NUMBER^MDC|1.0.0.3|System One|||||F  
 761 OBX|5|ST|531972^MDC\_ID\_PROD\_SPEC\_SERIAL^MDC|1.0.0.4|1000478|||||F  
 762 OBX|6|ST|531975^MDC\_ID\_PROD\_SPEC\_SW^MDC|1.1.1.5|1.0.0.5|||||F  
 763 OBX|7|ST|67916^MDC\_ATTR\_ID\_UDI^MDC|1.0.0.6|+M535NX10003A0/\$\$+735241/16D20180305J|||||F  
 764 OBX|8|ST|70934^MDC\_DEV\_HDIALY\_VMD^MDC|1.1|||||F  
 765 OBX|9|ST|70939^MDC\_DEV\_HDIALY\_MACH\_CONFIG\_CHAN^MDC|1.1.1|||||F  
 766 OBX|10|DTM|158592^MDC\_DEV\_HDIALY\_MACH\_TIME^MDC|1.1.1.1|20191003092024+0000|||||F  
 767 OBX|11|ST|158593^MDC\_DEV\_HDIALY\_MACH\_MODE\_DESCRIPTION^MDC|1.1.1.2|NxStage System One|||||F  
 768 OBX|12|ST|158594^MDC\_DEV\_HDIALY\_MACH\_MODE\_OF\_OPERATION^MDC|1.1.1.3|TX|||||F  
 769 OBX|13|NM|184195^MDC\_TIME\_PD\_MAINTENANCE\_TO\_NEXT\_SERVICE^MDC|1.1.1.4|12|h^h^UCUM|||||F  
 770 OBX|14|DTM|184199^MDC\_MAINTENANCE\_NEXT\_SERVICE\_DATE^MDC|1.1.1.5|20191003|||||F  
 771 OBX|15|NM|158595^MDC\_DEV\_HDIALY\_MACH\_MAINT\_TX\_REMAIN^MDC|1.1.1.6|45|||||F  
 772 OBX|16|ST|158596^MDC\_DEV\_HDIALY\_MACH\_BLD\_PUMP\_ON^MDC|1.1.1.7|T|||||F  
 773 OBX|17|ST|158597^MDC\_DEV\_HDIALY\_MACH\_TX\_FLUID\_BYPASS^MDC|1.1.1.8|F|||||F  
 774 OBX|18|ST|158598^MDC\_DEV\_HDIALY\_MACH\_TX\_MODALITY^MDC|1.1.1.9|HDF|||||F  
 775 OBX|19|NM|158720^MDC\_DEV\_HDIALY\_MACH\_THERAPY\_TIME^MDC|1.1.1.10|180|min^min^UCUM|||||F  
 776 OBX|20|NM|158724^MDC\_DEV\_HDIALY\_MACH\_TIME\_REMAIN^MDC|1.1.1.11|600|min^min^UCUM|||||F  
 777 OBX|21|NM|188508^MDC\_TEMP\_ROOM^MDC|1.1.1.12|20|Cel^Cel^UCUM|||||F  
 778 OBX|22|ST|70943^MDC\_DEV\_HDIALY\_ANTICOAG\_PUMP\_CHAN^MDC|1.1.2|||||F  
 779 OBX|23|ST|198236^MDC\_EVT\_HDIALY\_ANTICOAG\_STOP^MDC|1.1.2.4|F|||||F  
 780 OBX|24|ST|158599^MDC\_DEV\_HDIALY\_ANTICOAG\_NAME^MDC|1.1.2.5|heparin|||||F  
 781 OBX|25|ST|158600^MDC\_DEV\_HDIALY\_ANTICOAG\_MODE^MDC|1.1.2.6|CON|||||F  
 782 OBX|26|NM|0^MDC\_DEV\_HDIALY\_ANTICOAG\_INFUS\_RATE\_SETTING^MDC|1.1.2.7|50.0|ml/hr^ml/hr^UCUM|||||F  
 783 OBX|27|NM|158736^MDC\_DEV\_HDIALY\_ANTICOAG\_INFUS\_RATE^MDC|1.1.2.8|50.0|ml/hr^ml/hr^UCUM|||||F  
 784 OBX|28|NM|158728^MDC\_DEV\_HDIALY\_ANTICOAG\_ACCUM\_DELIV^MDC|1.1.2.9|60.0|ml^ml^UCUM|||||F  
 785

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786 OBX|29|NM|68142^MDC\_ATTR\_CHAN\_NUM\_LOGICAL^MDC|1.1.2.10|1|||||F

787 OBX|30|ST|198238^MDC\_EVT\_HDIALY\_ANTICOAG\_SYRINGE\_EMPTY^MDC|1.1.2.11|F|||||F

788 OBX|31|ST|158602^MDC\_HDIALY\_ANTICOAG\_SYRINGE\_BRAND^MDC|1.1.2.12|Fishman|||||F

789 OBX|323|NM|158603^MDC\_HDIALY\_ANTICOAG\_SYRINGE\_VOL^MDC|1.1.2.13|60|ml^ml^UCUM|||||F

790 OBX|33|ST|198240^MDC\_EVT\_HDIALY\_ANTICOAG\_SYRINGE\_SIZE^MDC|1.1.2.14|F|||||F

791 OBX|34|ST|70947^MDC\_DEV\_HDIALY\_BLOOD\_PUMP\_CHAN^MDC|1.1.3|||||F

792 OBX|35|NM|158740^MDC\_HDIALY\_BLD\_PUMP\_BLOOD\_FLOW\_RATE^MDC|1.1.3.1|250|ml/min^ml/min^UCUM|||||F

793 OBX|36|NM|16935956^MDC\_HDIALY\_BLD\_PUMP\_BLOOD\_FLOW\_RATE\_SETTING^MDC|1.1.3.2|250|ml/min^ml/min^UCUM|  
794 M|||||F

795 OBX|37|NM|158743^MDC\_HDIALY\_BLD\_PUMP\_BLOOD\_FLOW\_RATE\_MEAN^MDC|1.1.3.3|250|ml/min^ml/min^UCUM|  
796 |F

797 OBX|38|NM|158744^MDC\_HDIALY\_BLD\_PRESS\_ART^MDC|1.1.3.4|-75|mm[Hg]^mm[Hg]^UCUM|< -200|||||F

798 OBX|39|ST|158604^MDC\_HDIALY\_BLD\_PUMP\_MODE^MDC|1.1.3.5|2N|||||F

799 OBX|40|ST|198242^MDC\_EVT\_HDIALY\_BLD\_PUMP\_STOP^MDC|1.1.3.6|F|||||F

800 OBX|41|ST|158605^MDC\_HDIALY\_BLD\_PUMP\_TUBING\_SIZE^MDC|1.1.3.7|8 mm|||||F

801 OBX|42|NM|158748^MDC\_HDIALY\_BLOOD\_TEMP\_ART^MDC|1.1.3.8|39.1|Cel^Cel^UCUM|||||F

802 OBX|43|NM|158752^MDC\_HDIALY\_BLD\_PUMP\_CHANGE\_IN\_ENERGY^MDC|1.1.3.9|1|kJ/h^kJ/h^UCUM|||||F

803 OBX|44|NM|158756^MDC\_HDIALY\_BLD\_PUMP\_PRESS\_ART\_POST\_PUMP^MDC|1.1.3.10|100|mm[Hg]^mm[Hg]^UCUM|  
804 |F

805 OBX|45|NM|158760^MDC\_HDIALY\_BLD\_PUMP\_PRIMING\_VOL^MDC|1.1.3.11|191|ml^ml^UCUM|||||F

806 OBX|46|NM|158764^MDC\_HDIALY\_BLD\_PUMP\_SINGLE\_NEEDLE\_PRESS^MDC|1.1.3.12|200|mm[Hg]^ml[Hg]^UCUM|  
807 |F

808 OBX|47|NM|158772^MDC\_HDIALY\_BLD\_PUMP\_BLOOD\_PROCESSED\_TOTAL^MDC|1.1.3.14|120|L^L^UCUM|||||F

809 OBX|48|NM|158776^MDC\_HDIALY\_BLD\_PUMP\_PRESS\_VEN^MDC|1.1.3.15|200|mm[Hg]^mm[Hg]^UCUM|20-400|||||F

810 OBX|49|NM|158780^MDC\_HDIALY\_BLOOD\_TEMP\_VEN^MDC|1.1.3.16|39.1|Cel^Cel^UCUM|||||F

811 OBX|50|NM|16935996^MDC\_HDIALY\_BLOOD\_TEMP\_VEN\_SETTING^MDC|1.1.3.17|39.0|Cel^Cel^UCUM|||||F

812 OBX|51|ST|70951^MDC\_DEV\_HDIALY\_FLUID\_CHAN^MDC|1.1.4|||||F

813 OBX|52|NM|158784^MDC\_HDIALY\_BICARB\_COND^MDC|1.1.4.1|13.81|mS/cm^mS/cm^UCUM|||||F

814 OBX|53|NM|16936000^MDC\_HDIALY\_BICARB\_COND\_SETTING^MDC|1.1.4.2|13.81|mS/cm^mS/cm^UCUM|||||F

815 OBX|54|NM|158788^MDC\_HDIALY\_DIALYSATE\_COND^MDC|1.1.4.3|13.81|mS/cm^mS/cm^UCUM|||||F

816 OBX|55|NM|16936004^MDC\_HDIALY\_DIALYSATE\_COND\_SETTING^MDC|1.1.4.4|13.81|mS/cm^mS/cm^UCUM|||||F

817 OBX|56|NM|158792^MDC\_HDIALY\_DIALYSATE\_FLOW\_RATE^MDC|1.1.4.5|99|ml/min^ml/min^UCUM|||||F

818 OBX|57|NM|16936008^MDC\_HDIALY\_DIALYSATE\_FLOW\_RATE\_SETTING^MDC|1.1.4.6|100|ml/min^ml/min^UCUM|  
819 |F

820 OBX|58|ST|158606^MDC\_HDIALY\_DIALYSATE\_FLOW\_MODE^MDC|1.1.4.7|CONST|||||F

821 OBX|59|NM|158800^MDC\_HDIALY\_DIALYSATE\_AMMONIA^MDC|1.1.4.10|0.00|[ppm]^ppm^UCUM|||||F

822 OBX|60|NM|158795^MDC\_HDIALY\_DIALYSATE\_FLOW\_RATE\_MEAN^MDC|1.1.4.11|100|ml/min^ml/min^UCUM|||||F

823 OBX|61|NM|16936020^MDC\_HDIALY\_CONC\_HCO3\_SETTING^MDC|1.1.4.13|32.0|mmol/L^mmol/L^UCUM|||||F

824 OBX|62|ST|158607^MDC\_HDIALY\_CONC\_HCO3\_MODE^MDC|1.1.4.14|PRO|||||F

825 OBX|63|ST|198244^MDC\_EVT\_HDIALY\_BLOOD\_LEAK^MDC|1.1.4.15|F|||||F

826 OBX|64|ST|158608^MDC\_HDIALY\_DIALYSATE\_NAME^MDC|1.1.4.16|FMC smartbag 111.5|Bbraun Duosol  
827 35|||||F

828 OBX|65|NM|158808^MDC\_HDIALY\_DIALYSATE\_CONC\_ACETATE^MDC|1.1.4.17|3.00|mmol/L^mmol/L^UCUM|||||F

829 OBX|66|NM|158812^MDC\_HDIALY\_DIALYSATE\_CONC\_HCO3^MDC|1.1.4.18|35.0|mmol/L^mmol/L^UCUM|||||F

830 OBX|67|NM|158816^MDC\_HDIALY\_DIALYSATE\_CONC\_CHLORIDE^MDC|1.1.4.19|108.00|mmol/L^mmol/L^UCUM|  
831 |||20191003085024+0000

832 OBX|68|NM|158820^MDC\_HDIALY\_DIALYSATE\_CONC\_MG^MDC|1.1.4.20|0.5|mmol/L^mmol/L^UCUM|  
833 03085024+0000

834 OBX|69|NM|158824^MDC\_HDIALY\_DIALYSATE\_CONC\_CA^MDC|1.1.4.21|1.50|mmol/L^mmol/L^UCUM|  
|F|||20191

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835 003085024+0000

836 OBX|70|NM|158828^MDC\_HDIALY\_DIALYSATE\_CONC\_CITRATE^MDC|1.1.4.22|0.0|mmol/L^mmol/L^UCUM|||||F

837 OBX|71|NM|158832^MDC\_HDIALY\_DIALYSATE\_CONC\_GLU^MDC|1.1.4.23|1.00|mmol/L^mmol/L^UCUM|||||F

838 OBX|72|NM|158836^MDC\_HDIALY\_DIALYSATE\_CONC\_K^MDC|1.1.4.24|1.00|mmol/L^mmol/L^UCUM|||||F||201910

839 03085024+0000

840 OBX|73|NM|158840^MDC\_HDIALY\_DIALYSATE\_CONC\_NA^MDC|1.1.4.25|138|mmol/L^mmol/L^UCUM|||||F||201910

841 03085024+0000

842 OBX|74|NM|16936056^MDC\_HDIALY\_DIALYSATE\_CONC\_NA\_SETTING^MDC|1.1.4.26|140|mmol/L^mmol/L^UCUM|||||

843 F

844 OBX|75|ST|158609^MDC\_HDIALY\_DIALYSATE\_CONC\_NA\_MODE^MDC|1.1.4.27|CONST|||||F

845 OBX|76|NM|158844^MDC\_HDIALY\_DIALYSATE\_CONC\_PH^MDC|1.1.4.28|7.0|[pH]^pH^UCUM|||||F

846 OBX|77|NM|158848^MDC\_HDIALY\_DIALYSATE\_VOL\_DELIV^MDC|1.1.4.29|24.34|L^L^UCUM|||||F

847 OBX|78|ST|70955^MDC\_DEV\_HDIALY\_FILTER\_CHAN^MDC|1.1.5|||||F

848 OBX|79|ST|158610^MDC\_HDIALY\_FILTER\_NAME^MDC|1.1.5.1|NxStage CAR125|||||F

849 OBX|80|NM|158852^MDC\_HDIALY\_FILTER\_TRANSMEMBRANE\_PRESS^MDC|1.1.5.2|35|mm[Hg]^mm[Hg]^UCUM|||||F

850 OBX|81|NM|158611^MDC\_HDIALY\_FILTER\_NUM^MDC|1.1.5.3|1|||F

851 OBX|82|ST|158612^MDC\_HDIALY\_FILTER\_UDI^MDC|1.1.5.4|(01)00842289101845(17)201200(10)LOT00606||

852 |||F

853 OBX|83|ST|70959^MDC\_DEV\_HDIALY\_CONVECTIVE\_CHAN^MDC|1.1.6|||||F

854 OBX|84|ST|158613^MDC\_HDIALY\_RF\_DILUTION\_LOCATION^MDC|1.1.6.1|PREF-POSTF|||||F

855 OBX|85|ST|158614^MDC\_HDIALY\_RF\_POST\_FILTER\_NAME^MDC|1.1.6.2|multiBIC|||F

856 OBX|86|NM|158856^MDC\_HDIALY\_RF\_POST\_FILTER\_CONC\_ACETATE^MDC|1.1.6.3|0|mmol/L^mmol/L^UCUM|||||F

857 OBX|87|NM|158860^MDC\_HDIALY\_RF\_POST\_FILTER\_CONC\_HCO3^MDC|1.1.6.4|35.0|mmol/L^mmol/L^UCUM|||||F

858 OBX|88|NM|158864^MDC\_HDIALY\_RF\_POST\_FILTER\_CONC\_CHLORIDE^MDC|1.1.6.5|111.00|mmol/L^mmol/L^UCUM||

859 |||F

860 OBX|89|NM|158868^MDC\_HDIALY\_RF\_POST\_FILTER\_CONC\_MG^MDC|1.1.6.6|0.5|mmol/L^mmol/L^UCUM|||||F

861 OBX|90|NM|158824^MDC\_HDIALY\_DIALYSATE\_CONC\_CA^MDC|1.1.6.7|1.50|mmol/L^mmol/L^UCUM|||||F

862 OBX|91|NM|158876^MDC\_HDIALY\_RF\_POST\_FILTER\_CONC\_CITRATE^MDC|1.1.6.8|0.0|mmol/L^mmol/L^UCUM|||||F

863 OBX|92|NM|158880^MDC\_HDIALY\_RF\_POST\_FILTER\_CONC\_GLU^MDC|1.1.6.9|5.55|mmol/L^mmol/L^UCUM|||||F

864 OBX|93|NM|158884^MDC\_HDIALY\_RF\_POST\_FILTER\_CONC\_K^MDC|1.1.6.10|2.00|mmol/L^mmol/L^UCUM|||||F

865 OBX|94|NM|158888^MDC\_HDIALY\_RF\_POST\_FILTER\_CONC\_NA^MDC|1.1.6.11|140|mmol/L^mmol/L^UCUM|||||F

866 OBX|85|NM|158892^MDC\_HDIALY\_RF\_POST\_FILTER\_FLOW\_RATE^MDC|1.1.6.12|60|ml/min^ml/min^UCUM|||||F

867 OBX|96|NM|16936108^MDC\_HDIALY\_RF\_POST\_FILTER\_FLOW\_RATE\_SETTING^MDC|1.1.6.13|60|ml/min^ml/min^UCU

868 M|||||F

869 OBX|97|NM|158895^MDC\_HDIALY\_RF\_POST\_FILTER\_FLOW\_RATE\_MEAN^MDC|1.1.6.14|60|ml/min^ml/min^UCUM|||

870 |F

871 OBX|98|NM|158896^MDC\_HDIALY\_RF\_POST\_FILTER\_TEMP^MDC|1.1.6.15|39.9|Cel^Cel^UCUM|||||F

872 OBX|99|NM|16936112^MDC\_HDIALY\_RF\_POST\_FILTER\_TEMP\_SETTING^MDC|1.1.6.16|41.0|Cel^Cel^UCUM|||||F

873 OBX|100|NM|158900^MDC\_HDIALY\_RF\_POST\_FILTER\_VOL^MDC|1.1.6.17|6.00|L^L^UCUM|||||F

874 OBX|101|NM|16936116^MDC\_HDIALY\_RF\_POST\_FILTER\_VOL\_SETTING^MDC|1.1.6.18|12.00|L^L^UCUM|||||F

875 OBX|102|ST|158615^MDC\_HDIALY\_RF\_PRE\_FILTER\_NAME^MDC|1.1.6.19|multiBIC|||||F

876 OBX|103|NM|158904^MDC\_HDIALY\_RF\_PRE\_FILTER\_CONC\_ACETATE^MDC|1.1.6.20|0|mmol/L^mmol/L^UCUM|||||F

877 OBX|104|NM|158908^MDC\_HDIALY\_RF\_PRE\_FILTER\_CONC\_HCO3^MDC|1.1.6.21|35.0|mmol/L^mmol/L^UCUM/L|||

878 F

879 OBX|105|NM|158912^MDC\_HDIALY\_RF\_PRE\_FILTER\_CONC\_CHLORIDE^MDC|1.1.6.22|111.00|mmol/L^mmol/L^UCUM|

880 |||F

881 OBX|106|NM|158916^MDC\_HDIALY\_RF\_PRE\_FILTER\_CONC\_MG^MDC|1.1.6.23|0.5|mmol/L^mmol/L^UCUM|||||F

882 OBX|107|NM|158920^MDC\_HDIALY\_RF\_PRE\_FILTER\_CONC\_CA^MDC|1.1.6.24|1.50|mmol/L^mmol/L^UCUM|||||F

883 OBX|108|NM|158924^MDC\_HDIALY\_RF\_PRE\_FILTER\_CONC\_CITRATE^MDC|1.1.6.25|0.0|mmol/L^mmol/L^UCUM|||||

884 F

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885 OBX|109|NM|158928^MDC\_HDIALY\_RF\_PRE\_FILTER\_CONC\_GLU^MDC|1.1.6.26|5.55|mmol/L^mmol/L^UCUM|||||F

886 OBX|110|NM|158932^MDC\_HDIALY\_RF\_PRE\_FILTER\_CONC\_K^MDC|1.1.6.27|2.00|mmol/L^mmol/L^UCUM|||||F

887 OBX|111|NM|158936^MDC\_HDIALY\_RF\_PRE\_FILTER\_CONC\_NA^MDC|1.1.6.28|140|mmol/L^mmol/L^UCUM|||||F

888 OBX|112|NM|158940^MDC\_HDIALY\_RF\_PRE\_FILTER\_FLOW\_RATE^MDC|1.1.6.29|60|ml/min^ml/min^UCUM|||||F

889 OBX|113|NM|16936156^MDC\_HDIALY\_RF\_PRE\_FILTER\_FLOW\_RATE\_SETTING^MDC|1.1.6.30|60|ml/min^ml/min^UCUM  
890 M|||||F

891 OBX|114|NM|158943^MDC\_HDIALY\_RF\_PRE\_FILTER\_FLOW\_RATE\_MEAN^MDC|1.1.6.31|60|ml/min^ml/min^UCUM|||||  
892 F

893 OBX|115|NM|158944^MDC\_HDIALY\_RF\_PRE\_FILTER\_TEMP^MDC|1.1.6.32|39.9|Cel^Cel^UCUM|||||F

894 OBX|116|NM|16936160^MDC\_HDIALY\_RF\_PRE\_FILTER\_TEMP\_SETTING^MDC|1.1.6.33|41.0|Cel^Cel^UCUM|||||F

895 OBX|117|NM|158948^MDC\_HDIALY\_RF\_PRE\_FILTER\_VOL^MDC|1.1.6.34|1.23|L^L^UCUM|||||F

896 OBX|118|NM|16936164^MDC\_HDIALY\_RF\_PRE\_FILTER\_VOL\_SETTING^MDC|1.1.6.35|3.00|L^L^UCUM|||||F

897 OBX|119|NM|158952^MDC\_HDIALY\_RF\_CONV\_CLEARANCE^MDC|1.1.6.36|31.6|ml/min^ml/min^UCUM|||||F

898 OBX|120|ST|198246^MDC\_EVT\_HDIALY\_RF\_EXCESS\_DELIV^MDC|1.1.6.37|F|||||F

899 OBX|121|ST|198248^MDC\_EVT\_HDIALY\_RF\_INSUFF\_DELIV^MDC|1.1.6.38|F|||||F

900 OBX|122|NM|16936172^MDC\_HDIALY\_RF\_PRE\_POST\_FLOW\_RATIO\_SETTING^MDC|1.1.6.39|3.00|||||F

901 OBX|123|NM|158960^MDC\_HDIALY\_RF\_BOLUS\_RATE^MDC|1.1.6.40|0|ml/min^ml/min^UCUM|||||F

902 OBX|124|NM|16936180^MDC\_HDIALY\_RF\_BOLUS\_VOL\_SETTING^MDC|1.1.6.42|3.00|mL^mL^UCUM|||||F

903 OBX|125|NM|158968^MDC\_HDIALY\_RF\_BOLUS\_VOL\_DELIVERED^MDC|1.1.6.41|0.00|mL^mL^UCUM|||||F

904 OBX|126|ST|158616^MDC\_HDIALY\_RF\_FLOW\_MODE^MDC|1.1.6.43|CONST|||||F

905 OBX|127|ST|158617^MDC\_HDIALY\_RF\_SOURCE^MDC|1.1.6.44|BAG|||||F

906 OBX|128|ST|70963^MDC\_DEV\_HDIALY\_SAFETY\_SYSTEMS\_CHAN^MDC|1.1.7|||||F

907 OBX|129|ST|198252^MDC\_EVT\_HDIALY\_SAFETY\_ART\_AIR\_DETECT^MDC|1.1.7.1|F|||||F

908 OBX|130|ST|198254^MDC\_EVT\_HDIALY\_SAFETY\_DIALYSATE\_AIR\_DETECT^MDC|1.1.7.2|F|||||F

909 OBX|131|ST|198256^MDC\_EVT\_HDIALY\_SAFETY\_DIALYSATE\_COMPOSITION^MDC|1.1.7.3|F|||||F

910 OBX|132|ST|198258^MDC\_EVT\_HDIALY\_SAFETY\_SYSTEM\_GENERAL^MDC|1.1.7.4|F|||||F

911 OBX|133|ST|198216^MDC\_EVT\_SELFTEST\_FAILURE^MDC|1.1.7.5|F|||||F

912 OBX|134|ST|198260^MDC\_EVT\_HDIALY\_SAFETY\_VEN\_ACCESS^MDC|1.1.7.6|F|||||F

913 OBX|135|ST|198262^MDC\_EVT\_HDIALY\_SAFETY\_VEN\_AIR\_DETECT^MDC|1.1.7.7|F|||||F

914 OBX|136|ST|198264^MDC\_EVT\_HDIALY\_SAFETY\_WETNESS\_DETECT\_ALERT^MDC|1.1.7.8|F|||||F

915 OBX|137|ST|198266^MDC\_EVT\_HDIALY\_SAFETY\_WETNESS\_DETECT\_ERROR^MDC|1.1.7.9|F|||||F

916 OBX|138|NM|68489^MDC\_ATTR\_ALERT\_ID\_NUM^MDC|1.1.7.10|0|||||F

917 OBX|139|ST|68546^MDC\_ATTR\_ALERT\_TEXT^MDC|1.1.7.11|||||F

918 OBX|140|ST|70967^MDC\_DEV\_HDIALY\_THERAPY\_OUTCOMES\_CHAN^MDC|1.1.8|||||F

919 OBX|141|NM|158972^MDC\_HDIALY\_THERAPY\_MASS\_TRF\_AREA\_COEFF^MDC|1.1.8.1|700|||||F

920 OBX|142|NM|158976^MDC\_HDIALY\_THERAPY\_ACCESS\_FLOW^MDC|1.1.8.2|250|ml/min^ml/min^UCUM|||||F

921 OBX|143|NM|158980^MDC\_HDIALY\_THERAPY\_RATIO\_EKT\_OVER\_V\_DELIVERED^MDC|1.1.8.4|1.1|%^%^UCUM|||||F

922 OBX|144|NM|158984^MDC\_HDIALY\_THERAPY\_KT\_DELIVERED^MDC|1.1.8.5|42.0|L^L^UCUM|||||F

923 OBX|145|NM|158988^MDC\_HDIALY\_THERAPY\_RATIO\_SPKT\_OVER\_V\_DELIVERED^MDC|1.1.8.6|1.1|%^%^UCUM|||||F

924 OBX|146|ST|198268^MDC\_EVT\_HDIALY\_THERAPY\_PAT\_TX\_GENERAL^MDC|1.1.8.7|F|||||F

925 OBX|147|NM|158992^MDC\_HDIALY\_THERAPY\_RATIO\_KT\_OVER\_V\_GOAL^MDC|1.1.8.10|1.21|%^%^UCUM|||||F

926 OBX|148|NM|159019^MDC\_HDIALY\_THERAPY\_UREA\_CLEARANCE\_MEAN^MDC|1.1.8.11|70|||||F

927 OBX|149|NM|159000^MDC\_HDIALY\_THERAPY\_BODY\_START\_WT^MDC|1.1.8.12|75.9|kg^kg^UCUM|||||F

928 OBX|150|NM|159004^MDC\_HDIALY\_THERAPY\_PCT\_RECIRC^MDC|1.1.8.13|20|%^%^UCUM|||||F

929 OBX|151|NM|159008^MDC\_HDIALY\_THERAPY\_PLASMA\_NA\_CONC^MDC|1.1.8.14|140|mmol/L^mmol/L^UCUM|||||F

930 OBX|152|NM|159012^MDC\_HDIALY\_THERAPY\_RATIO\_SPKT\_OVER\_V\_PROJECTED^MDC|1.1.8.16|1.1|%^%^UCUM  
931 |||||F

932 OBX|153|ST|158618^MDC\_HDIALY\_THERAPY\_COMPLETE\_METHOD^MDC|1.1.8.18|UF|||||F

933 OBX|154|ST|198270^MDC\_EVT\_HDIALY\_THERAPY\_TX\_END\_TIME^MDC|1.1.8.19|F|||||F

934 OBX|155|NM|159016^MDC\_HDIALY\_THERAPY\_UREA\_CLEARANCE^MDC|1.1.8.20|196|||||F

935 OBX|156|NM|159020^MDC\_HDIALY\_THERAPY\_BODY\_END\_WT^MDC|1.1.8.21|75.9|kg^kg^UCUM|||||F

936 OBX|157|ST|70971^MDC\_DEV\_HDIALY\_UF\_CHAN^MDC|1.1.9|||||F

937 OBX|158|ST|198272^MDC\_EVT\_HDIALY\_UF\_LO^MDC|1.1.9.1|F|||||F

938 OBX|159|ST|198274^MDC\_EVT\_HDIALY\_UF\_NEG^MDC|1.1.9.2|F|||||F

939 OBX|160|NM|159024^MDC\_HDIALY\_UF\_TIME\_TO\_TARGET^MDC|1.1.9.3|55|min^min^UCUM|||||F

940 OBX|161|NM|159028^MDC\_HDIALY\_UF\_TARGET\_VOL\_TO\_REMOVE^MDC|1.1.9.4|2000|ml^ml^UCUM|||||F

941 OBX|162|NM|159032^MDC\_HDIALY\_UF\_ACTUAL\_REMOVED\_VOL^MDC|1.1.9.5|555|ml^ml^UCUM|||||F

942 OBX|163|ST|198276^MDC\_EVT\_HDIALY\_UF\_RATE\_RANGE^MDC|1.1.9.6|F|||||F

943 OBX|164|ST|198278^MDC\_EVT\_HDIALY\_UF\_GOAL\_MET^MDC|1.1.9.7|F|||||F

944 OBX|165|ST|158619^MDC\_HDIALY\_UF\_MODE^MDC|1.1.9.8|CONST-WT|||||F

945 OBX|166|NM|159036^MDC\_HDIALY\_UF\_RATE^MDC|1.1.9.9|100|ml/h^ml/h^UCUM|||||F

946 OBX|167|NM|16936252^MDC\_HDIALY\_UF\_RATE\_SETTING^MDC|1.1.9.9|100|ml/h^ml/h^UCUM|||||F

947 OBX|168|ST|198276^MDC\_EVT\_HDIALY\_UF\_RATE\_RANGE^MDC|1.1.9.10|F|||||F

948 OBX|169|NM|16936257^MDC\_HDIALY\_UF\_RATE\_LIMIT\_HIGH\_SETTING^MDC|1.1.9.11|150|ml/h^ml/h^UCUM|||||F

949 OBX|170|NM|16936259^MDC\_HDIALY\_UF\_RATE\_LIMIT\_LOW\_SETTING^MDC|1.1.9.12|90|ml/h^ml/h^UCUM|||||F

950 OBX|171|ST|70686^MDC\_DEV\_PRESS\_BLD\_NONINV\_VMD^MDC|1.2|||||F

951 OBX|172|ST|70687^MDC\_DEV\_PRESS\_BLD\_NONINV\_CHAN^MDC|1.2.1|||||F

952 OBX|173|NM|67979^MDC\_ATTR\_TIME\_PD\_MSMT^MDC|1.2.1.1|30|min^min^UCUM|||||F|||20191003085024+0000

953 OBX|174|ST|68135^MDC\_ATTR\_PT\_BODY\_POSN^MDC|1.2.1.2|SUPINE|||||F|||20191003085024+0000

954 OBX|175|NM|150022^MDC\_PRESS\_BLD\_NONINV\_DIA^MDC|1.2.1.3|80|mm[Hg]^mm[Hg]^UCUM|||||F|||20191003085

955 024+0000

956 OBX|176|NM|149546^MDC\_PULS\_RATE\_NON\_INV^MDC|1.2.1.4|70|{beats}/min^{beats}/min^UCUM|||||F|||2019

957 1003085024+0000

958 OBX|177|NM|150023^MDC\_PRESS\_BLD\_NONINV\_MEAN^MDC|1.2.1.5|100|mm[Hg]^mm[Hg]^UCUM|||||F|||201910030

959 85024+0000

960 OBX|178|NM|150021^MDC\_PRESS\_BLD\_NONINV\_SYS^MDC|1.2.1.6|120|mm[Hg]^mm[Hg]^UCUM|||||F|||2019100308

961 5024+0000

962 OBX|179|ST|69642^MDC\_DEV\_ANALY\_SAT\_O2\_VMD^MDC|1.3|||||F

963 OBX|180|ST|69643^MDC\_DEV\_ANALY\_SAT\_O2\_CHAN^MDC|1.3.1|||||F

964 OBX|181|NM|150456^MDC\_PULS\_OXIM\_SAT\_O2^MDC|1.3.1.1|98|%^%^UCUM|||||F

965 OBX|182|NM|149530^MDC\_PULS\_OXIM\_PULS\_RATE^MDC|1.3.1.2|67|{beats}/min^{beats}/min^UCUM|||||F

966 OBX|183|ST|196638^MDC\_EVT\_ERR^MDC|1.3.1.3|F|||||F

967 OBX|184|ST|70974^MDC\_DEV\_BLOOD\_CHEM\_VMD^MDC|1.4|||||F

968 OBX|185|ST|70975^MDC\_DEV\_BLOOD\_CHEM\_CHAN^MDC|1.4.1|||||F

969 OBX|186|ST|158620^MDC\_HDIALY\_PLASMA\_VOL\_MARKER^MDC|1.4.1.1|NONE|||||F

970 OBX|187|ST|158621^MDC\_HDIALY\_PLASMA\_VOL\_PROFILE^MDC|1.4.1.2|FLAT|||||F

971 OBX|188|NM|160132^MDC\_CONC\_HCT\_GEN^MDC|1.4.1.3|0.45|%^{vol}^%^{vol}^UCUM|||||F

972 OBX|189|NM|160120^MDC\_CONC\_HB\_GEN^MDC|1.4.1.4|13.6|g/dL^g/dL^UCUM|||||F

973 OBX|190|NM|159044^MDC\_HDIALY\_REL\_BLOOD\_VOL^MDC|1.4.1.5|35|%^%^UCUM|||||F

974 OBX|191|NM|150316^MDC\_SAT\_O2^MDC|1.4.1.6|98|%^%^UCUM|||||F

### 6.3 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.

### 6.3.1 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]

### 6.3.2 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
```

### 6.3.3 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
```

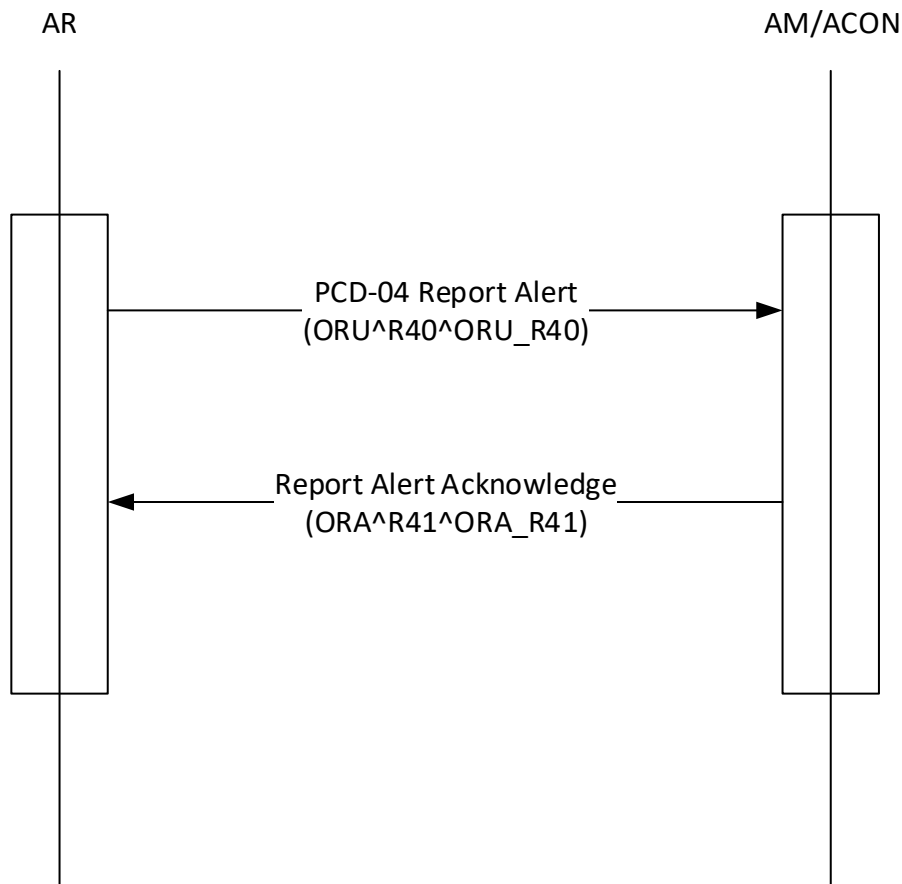
## 7 Reporting Alarm Information

### 7.1 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).



002

**Figure 9 - AR sends Report Alert to AM and/or ACON as an HL7 ORU message.**

003

004

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

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

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

## 016 7.2 Device Request

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

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

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

## 7.2.1 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 in a specific order.

- OBX 1 identifies the type of alarm.
- OBX 2 identifies the event source. For numeric values this includes the object value and limits. This is the Source Column in Table 3 – Dialysis Machine Alarms/Alerts.
- 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 segment 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 3. For non-numeric alarms, this field is the Event Identifier Column in Table 3.

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 3.

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 3.

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 3.

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 3.

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

Note, alarm limits may be fixed or machine generated.

**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 segment 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 segment 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 segment 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".

**7.2.2 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^MDC|1.0.0|||||F
OBX|2|ST|70934^MDC_DEV_HDIALY_VMD^MDC|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

```

**7.2.3 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^MDC|1.0.0|||||F
OBX|2|ST|70934^MDC_DEV_HDIALY_VMD^MDC|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

```

**7.2.4 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^MDC|1.0.0|||||F

```

190 OBX|2|ST|70934^MDC\_DEV\_HDIALY\_VMD^MDC|1.1|||||F  
 191 OBX|3|CWE|196670^MDC\_EVT\_LO^MDC|1.0.0.1|158776^MDC\_HDIALY\_BLD\_PUMP\_PRESS\_VEN^MDC|||PH~SP|||F  
 192 OBX|4|NM|158776^MDC\_HDIALY\_BLD\_PUMP\_PRESS\_VEN^MDC|1.1.3.15.2|15|mm[Hg]^Millimeters of  
 193 Mercury^UCUM |20-400|||F  
 194 OBX|5|ST|68481^MDC\_ATTR\_EVENT\_PHASE^MDC|1.0.0.0.3|continue|||||F  
 195 OBX|6|ST|68482^MDC\_ATTR\_ALARM\_STATE^MDC|1.0.0.0.4|active|||||F  
 196 OBX|7|ST|68483^MDC\_ATTR\_ALARM\_INACTIVATION\_STATE^MDC|1.0.0.0.5|audio-paused|||||F

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

199 MSH|^~\&|ACME\_Dialysis\_Machine^080019FFFE3ED02D^EUI-  
 200 64|||20191003092025+0000||ORU^R40^ORU\_R40|20191003092024|P|2.6|||AL|NE|||IHE\_PCD\_001^IHEPC  
 201 D^1.3.6.1.4.1.19376.1.6.1.4.1^ISO  
 202 PID|||Scrubber 2000/SC678932^^^"U||^U  
 203 OBR|1||080019FFFE3ED02D20110602045842^ACME\_Dialysis\_Machine^080019FFFE3ED02D^EUI-  
 204 64|196616^MDC\_EVT\_ALARM^MDC|||20191003092024+0000  
 205 OBX|1|ST|70929^MDC\_DEV\_HDIALY\_MACHINE\_MDS^MDC|1.0.0|||||F  
 206 OBX|2|ST|70934^MDC\_DEV\_HDIALY\_VMD^MDC|1.1|||||F  
 207 OBX|3|CWE|196670^MDC\_EVT\_LO^MDC|1.0.0.0.1|158776^MDC\_HDIALY\_BLD\_PUMP\_PRESS\_VEN^MDC|||PH~SP|||F  
 208 OBX|4|NM|158776^MDC\_HDIALY\_BLD\_PUMP\_PRESS\_VEN^MDC|1.1.3.15.2|15|mm[Hg]^Millimeters of  
 209 Mercury^UCUM |20-400|||F  
 210 OBX|5|ST|68481^MDC\_ATTR\_EVENT\_PHASE^MDC|1.0.0.0.3|continue|||||F  
 211 OBX|6|ST|68482^MDC\_ATTR\_ALARM\_STATE^MDC|1.0.0.0.4|active|||||F  
 212 OBX|7|ST|68483^MDC\_ATTR\_ALARM\_INACTIVATION\_STATE^MDC|1.0.0.0.5|enabled|||||F

### 7.3 EMR Response

215 The EMR responds with a Report Alert Acknowledgement (ORA^R41^ORA\_R41).

#### 7.3.1 Message Structure

218 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]

#### 7.3.1 Example 1 – Accepted Response

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

222 MSH|^~\&|EMR|||20191003092025+0000||ACK^R40^ACK|XX3657|P|2.6|||NE|NE  
 223 MSA|AA|20191003092024

## 8 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.

### 8.1 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 0091 – Query Priority**

Value	Description
D	Deferred
I	Immediate

**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
A	Some, but not all, results available
P	Preliminary: A verified early result is available, final results not yet obtained

Value	Description
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)

240

241

**HL7 Table 0125 - Value type**

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

242

243

**HL7 Table 0155 - Accept/application acknowledgment conditions**

Value	Description
AL	Always

244

245

**HL7 Table 0208 – Query Response Status**

Value	Description
OK	Data found, no errors. This is the default value.
NF	No data found, no errors.
AE	Application Error
AR	Application Reject

246

247

**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
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 <i>other than</i> 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

Value	Description	Comment
		locked.
207	Application internal error	Rejection: A catchall for internal errors not explicitly covered by other codes.

**HL7 Table 0394 – Response Modality**

Value	Description
R	Real Time
T	Bolus (a series of responses sent at the same time without use of batch formatting)
B	Batch

**HL7 Table 0396 – Coding Systems**

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

**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

## 8.2 Segments

### 8.2.1 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.

## 8.2.2 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
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 Address 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

8.2.3 ORC – Order Common

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	ID	R	0119	Order Control
2	EI	R		Placer Order Number
3	EI	X		Filler Order Number
4	EI	X		Placer Group Number
5	ID	X	0038	Order Status
6	ID	O	0121	Response Flag
7		X		Quantity/Timing
8	EIP	X		Parent
9	DTM	X		Date/Time of Transaction
10	XCN	X		Entered By
11	XCN	X		Verified By
12	XCN	O		Ordering Provider
13	PL	X		Enterer's Location
14	XTN	O		Call Back Phone Number
15	DTM	X		Order Effective Date/Time
16	CWE	X	9999	Order Control Code Reason
17	CWE	X	9999	Entering Organization
18	CWE	X	9999	Entering Device
19	XCN	X		Action By
20	CWE	X	0339	Advanced Beneficiary Notice Code
21	XON	X		Ordering Facility Name
22	XAD	X		Ordering Facility Address
23	XTN	X		Ordering Facility Phone Number
24	XAD	X		Ordering Provider Address
25	CWE	X	9999	Order Status Modifier
26	CWE	X	0552	Advanced Beneficiary Notice Override Reason
27	DTM	X		Filler's Expected Availability Date/Time
28	CWE	X	0177	Confidentiality Code
29	CWE	X	0482	Order Type
30	CNE	X	0483	Enterer Authorization Mode
31	CWE	X		Parent Universal Service Identifier



SEQ	DT	OPT	TBL#	ELEMENT NAME
32	DT	X		Advanced Beneficiary Notice Date
33	CX	X		Alternate Placer Order Number

**ORC-1 Order Control**

Determines the function of the order segment. For the Prescription Query Response, the Order Control will always be "NW" (new order).

**ORC-2 Placer Order Number**

This field is the placer application's order number. The value is echoed back in the OBR-2 of the PCD-1 and PCD-4 messages.

**ORC-6 Response Flag**

This field allows the placer (sending) application to determine the amount of information to be returned from the filler. For the Prescription Query Response, the Response Flag will always be "N" (Only the MSA Segment is returned).

**ORC-12 Ordering Provider**

This field contains the identity of the person who is responsible for creating the request (i.e., ordering physician). If this field is present it may be used by the dialysis machine for prescription confirmation. In other words, the care-giver could ask if Dr. Smith is the patient's nephologist.

**ORC-14 Call Back Phone Number**

This field contains the telephone number to call for clarification of a request or other information regarding the order. If this field is present, a dialysis machine could be present its value to the user in case of a problem with prescription.

**8.2.4 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	C		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

HL7 Attribute Table - OBR Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
16	XCN	X		Ordering Provider
17	XTN	X		Order Callback Phone Number
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

365

366

**OBR-2 Placer Order Number**

367

if the dialysis machine downloaded a prescription, then this field will contain the value from OBC-2.

368

Otherwise, the field is blank.

369

**OBR-3 Filler Order Number**

370

**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.

371

372

**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

373

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.

XXXXXXXXXXXXXXXXXXYYYYMMDDhhmmss

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").

### 8.2.5 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.

413

**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

414

**OBX-1 Set ID**

415

HL7 Specification: This field contains the sequence number.

416

**OBX-2 Value Type**

417

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

418

This specification: Only value identified in the table below will be used. The value is based upon the value type as identified in Table 2 – Dialysis Machine Data Objects.

419

420

421

**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

422

**OBX-3 Observation Identifier**

423

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

424

This specification: The format is that of the Coded Element (CWE). Example:

425

426 "158606^MDC\_HDIALY\_DIALYSATE\_FLOW\_MODE^MDC".

#### 427 **OBX-4 Observation Sub-ID**

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

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

#### 432 **OBX-5 Observation Value**

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

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

#### 435 **OBX-6 Unit**

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

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

#### 439 **OBX-7 Reference Range**

440 HL7 Specification: Reference range for the value.

- 441 a) lower limit-upper limit (when both lower and upper limits are defined, e.g., for Venous Pressure, 20-400)
- 442 b) > lower limit (if no upper limit, e.g., >10)
- 443 c) < upper limit (if no lower limit, e.g., <15)

444 This specification: Dialysis Machines use this field in two ways.

- 445 1) For numeric measurements, this field may be used to provide the alarm limits.
- 446 2) For settings, this field may be used to specify legal values. For example, to require blood pump rate  
447 remain below 200 ml/min, a value of "< 200" would be used. To lock the blood pump rate at 250, a  
448 value of "250-250" would be used.

#### 449 **OBX-8 Interpretation Codes**

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

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

455 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

456 The Alarm Type is specific in the Alert Type Column in Table 2 – Dialysis Machine Data Objects.

Alarm Type	Code
Physiological	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.

#### OBX-17 Observation Method

HL7 Specification: This optional field can be used to transmit the method or procedure by which an observation was obtained when the sending system wishes to distinguish among one measurement obtained by different methods and the distinction is not implicit in the test ID.

This specification: Dialysis Machines will follow the IHE PCD recommendations for this field.

OBX-17	Description
AMEAS^auto-measurement^MDC	A measurement automatically taken by the machine. Examples are Arterial Pressure and Dialysate Temperature.
MMEAS^manual-measurement^MDC	A measurement taken due to user interaction. An example would be a Blood Pressure measurement taken using the NIBP system.
ASET^auto-setting^MDC	A setting that is being automatically determined by the machine.
MSET^manual-setting^MDC	A setting that was manually set or changed by the user. A prescription setting that was changed by the user would fall into this category.
RSET^remote-setting^MDC	A setting that was remotely set through a prescription downloaded from an EMR.

The field is optional for measurements. It is required for settings.

## 8.2.6 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
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

480

481

**PID-3.1 Patient Identifier List**

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483

484

485

486

ID Number contains a unique identifier for the patient assigned by the Device or entered by the User. Sample Identifier Type Codes are shown Table 0203 listed below (others can be included as defined in the HL7 Standard). The last identifier will always be the unique model/serial number of the Dialysis Machine with an identifier type code of U (see table following).

487

HL7 Table 0203

Code	Description	Notes	Use
MR	Medical Record Number		O
PN	Person Number		O
SS	Patient Social Security Number		O
U	Machine Identifier	Model, MDC_ID_MODEL_NUMBER, and Serial number, MDC_ID_PROD_SPEC_SERIAL, will be concatenated together to uniquely identify the machine. The format of the ID will be following: "model/serial"	R

488

Example Patient Identifier List with just model and serial number.

Scrubber 2000/SC678932^^^U

489

Example Patient Identifier List with Medical Record Number

555444222111^^^MR~Scrubber 2000/SC678932^^^U

491

492

Example Patient Identifier List with Person Number

010199-000H^^^PN~Scrubber 2000/SC678932^^^U

493

494

495

496

### 8.2.7 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.

497

498

499

500

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
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



HL7 Attribute Table - PV1 Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
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

501

**PV1-2 Patient Class (CWE)**

502

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

503

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

504

**PV1-2 Patient Class (PL)**

505

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

506  
507

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

508

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.

509  
510

Example: Nursing Unit

511

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

512

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.

**8.2.8 QAK – Query Acknowledge**

HL7 Attribute Table - QAK Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	ST	R		Query Tag
2	ID	R	0208	Query Response Status
3	CWE	O		Message Query Name
4	NM	O		Hit Count Total
5	NM	O		Hits In this Message
6	NM	R		Hits Remaining

**QAK-1 Query Tag**

HL7 Specification: This field may be valued by the initiating system to identify the query and may be used to match response messages to the originating query.

**QAK-2 Query Response Status**

HL7 Specification: This field allows the responding system to return a precise response status. It is especially useful in the case where no data is found that matches the query parameters, but where there is also no error.

**QAK-3 Message Query Name**

HL7 Specification: This field contains the name of the query.

**QAK-4 Hit Count Total**

HL7 Specification: This field contains the total number of records found by the EMR that matched the query.

**QAK-5 Hits In This Message**

HL7 Specification: This field contains the total number of matching records that the Server sent in the current response.

**QAK-6 Hits Remaining**

HL7 Specification: This field contains the number of matching records found by the Server that have yet to be

544 sent.

545 This specification: This value is used by the dialysis machine to determine when it has received all the results of  
546 a query.

## 547 8.2.9 QPD – Query Parameter Definition

HL7 Attribute Table - QPD Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	CWE	R		Message Query Name
2	ST	C		Query Tag
3-N	varies	R		Query Parameters

549 This segment is used in both the Patient Demographics Query (PDQ) transaction and the Patient Prescription  
550 Query (PPQ). The details of the fields are specified in those sections.

## 551 8.2.10RCP – Response Control Parameters

HL7 Attribute Table - RCP Segment

SEQ	DT	OPT	TBL#	ELEMENT NAME
1	ID	R	0091	Query Priority
2	CQ	X	0126	Quantity Limited Request
3	CNE	R	0394	Response Modality
4	DTM	X		Execution and Delivery Time
5	ID	X	0395	Modify Indicators
6	SRT	X		Sort By Field
7	ID	X	0391	Segment Group Inclusion

### 553 RCP-1 Query Priority

554 HL7 Specification: This field contains the time frame in which the response is expected, *HL7 Table 0091*.

555 This specification: This field will always be Immediate ("I").

### 556 RCP-3 Response Modality

557 HL7 Specification: This field specifies the timing and grouping of the response message(s), *HL7 Table 0394*.

558 This specification: This field will always be Real Time ("R").

## 9 Dialysis Data Elements

### 9.1 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. AKA CVVHD
HDF	Hemodiafiltration – dialysis with both diffusive and convective transport of solutes, CVVHDF
HF	Hemofiltration – dialysis with convective transport of solutes. CVVH
SLED	Sustained low efficiency dialysis.
IUF	Isolated Ultrafiltration - Removal of plasma water without dialysis, SCUF
HP	Hemoperfusion – Removal of solutes from blood by adsorption.

**\_TBL\_03 – Anticoagulation Mode**

<b>Value</b>	<b>Description</b>
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**

<b>Value</b>	<b>Description</b>
SITTING	Sitting
STANDING	Standing
SUPINE	Supine

**\_TBL\_05 – Blood Pump Mode**

<b>Value</b>	<b>Description</b>
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**

<b>Value</b>	<b>Description</b>
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**

<b>Value</b>	<b>Description</b>
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**

<b>Value</b>	<b>Description</b>
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**

<b>Value</b>	<b>Description</b>
PREF	Pre-Filter
POSTF	Post-Filter
PREF-POSTF	Both Pre-Filter and Post-Filter
PREP-POSTF	Both Pre-Pump and Post-Filter
MIDF	Mid Filter

**\_TBL\_09 – Fluid Source**

<b>Value</b>	<b>Description</b>
BAG	Bag – Replacement fluid
ONLINE	Online - Replacement fluid prepared by dialysis machine

**\_TBL\_10 – Plasma Volume Marker**

<b>Value</b>	<b>Description</b>
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**

<b>Value</b>	<b>Description</b>
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

**\_TBL\_11 – Plasma Volume Profile**

<b>Value</b>	<b>Description</b>
STEEP	Change greater than 6.5% per hour

**\_TBL\_12 – Completion Method**

<b>Value</b>	<b>Description</b>
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**

<b>Value</b>	<b>Description</b>
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**

<b>Value</b>	<b>Description</b>
CONST	Constant – Bicarbonate concentration in dialysis fluid is constant.
PRO	Profile - Bicarbonate concentration in



**\_TBL\_14 – Bicarb Delivery Mode**

<b>Value</b>	<b>Description</b>
	dialysis fluid is adjusted according to a programmed profile
NA	Not Applicable

**\_TBL\_15 – Sodium Delivery Mode**

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

**\_TBL\_16 – Anticoagulant Delivery Location**

<b>Value</b>	<b>Description</b>
PREP	Before the blood pump
PREF	After the blood pump but before the filter.
POSTF	After the filter.
PAT	At the patient

**\_TBL\_17 – Profile Type**

<b>Value</b>	<b>Description</b>
CONST	Constant rate
LINEAR	Linear profile
EXPONENTIAL	Exponential profile
STEP	Step profile
VENDOR	Vendor Specific Profile

## 9.2 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  $\text{Partition} * 2^{16} + \text{Term Code}$ . 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:

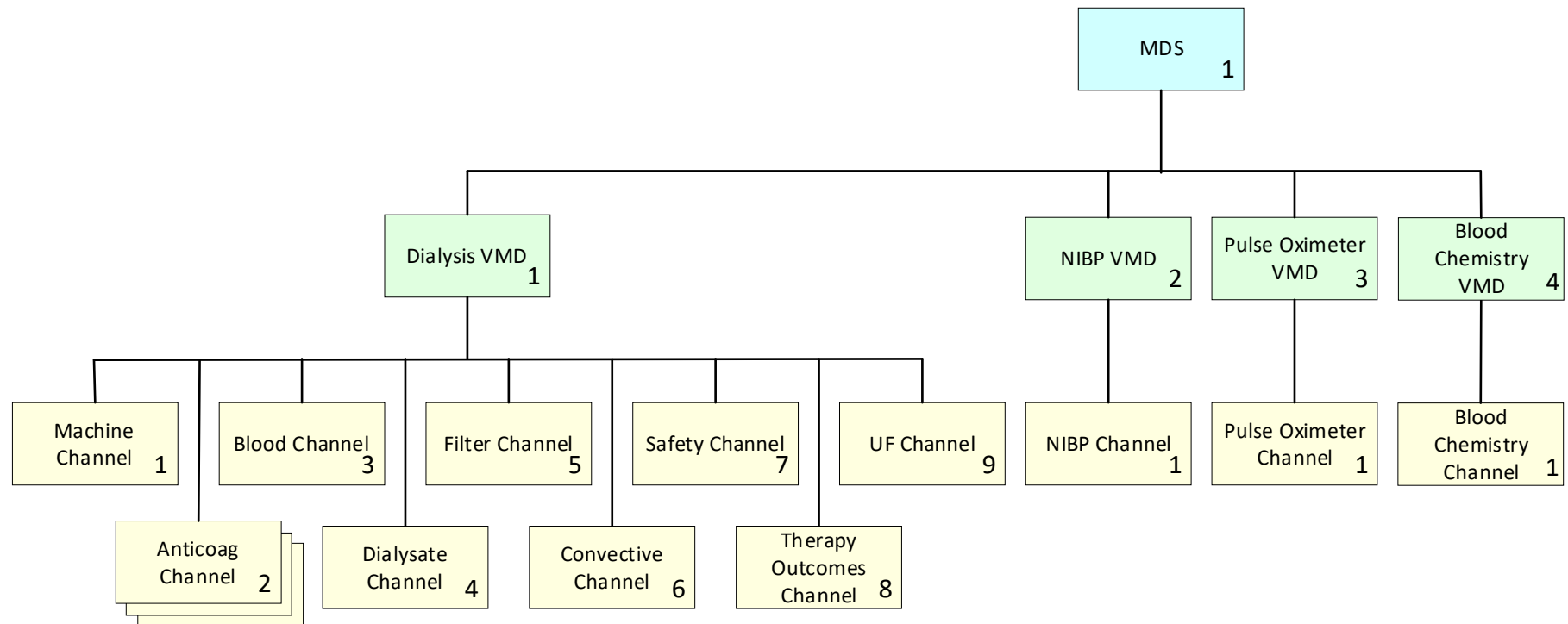
192548^MDCACME\_BLOOD\_TEMP\_SETTING^MDC

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.

## 9.3 Common Data Objects





The following rules are used when converting usage to cardinality.

1. Any object listed as Mandatory will have a cardinality of "1..X". Where X is the maximum number possible or "N" if the number is unlimited/unknown.
2. Any object listed as Optional will have a cardinality of "0..X".
3. Any object listed as Conditional will have a cardinality of "0..X". If the condition is TRUE then the effective cardinality is "1..X". If the condition is FALSE then the effective cardinality is "0..0".
4. If a channel is conditional and the condition is FALSE, then none of the channel's metrics will be present regardless of their MOC/cardinality. This is another way to say cardinality scope applies within the parent container.
5. Metric should not be listed as conditional unless their condition is different from the channel's condition.

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.
- 13) If alarm limit is being set.
- 14) If Completion Method (MDC\_HDIALY\_THERAPY\_COMPLETE\_METHOD) is Clock Time.
- 15) If Completion Method (MDC\_HDIALY\_THERAPY\_COMPLETE\_METHOD) is Treatment Time.
- 16) If Mode is HF or HDF and Dilution is Pre or Pre-Post
- 17) If Completion Method (MDC\_HDIALY\_THERAPY\_COMPLETE\_METHOD) is Kt/V.
- 18) If UF Target (MDC\_HDIALY\_UF\_TARGET\_VOL\_TO\_REMOVE) or Treatment Time (MDC\_HDIALY\_THERAPY\_TX\_TIME\_SETTING) is not present.
- 19) If UF Mode (MDC\_HDIALY\_UF\_MODE) is not constant.
- 20) If Anticoagulant Mode (MDC\_HDIALY\_ANTICOAG\_MODE) is not constant.
- 22) If Dialysate Mode (MDC\_HDIALY\_DIALYSATE\_FLOW\_MODE) is not constant.

- 23) If Sodium Mode (MDC\_HDIALY\_DIALYSATE\_CONC\_NA\_MODE) is not constant.
- 24) If RF Delivery Mode (MDC\_HDIALY\_RF\_FLOW\_MODE) is not constant.
- 91) If Profile Type is not Vendor then 'M' otherwise 'X'.
- 92) If Profile Type is not Vendor then 'O' otherwise 'X'.
- 93) If Profile Type is Exponential then 'O' otherwise 'X'.
- 94) If Profile Type is Vendor then 'M' otherwise 'X'.
- 95) If Profile Type is Vendor then 'O' otherwise 'X'.

In addition to the above conditions, the following general rule applies.

- 1) Any prescription setting sent from the EMR to the dialysis machine, will be reported in the PCD-01 Status message.

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 – Profile Parameters contains the objects that are needed to define a profile. These objects are referenced in Table 2 – Dialysis Machine Data Objects where appropriate.

Table 1 – Profile Parameters

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
... MDC_HDIALY_PROFILE_TYPE			Profile Type	Contains the anticoagulant profile type.	All	Parameter	Episodic	<a href="#">TBL 17</a>	Alphanumeric	N/A	1..1	M	M
... MDC_HDIALY_PROFILE_VALUE			Profile Values	Contains the control points of the profile. The control points are a numeric array. For a constant profile there is only one point. For a linear or exponential profile there are two points, one for the starting value and one for the ending	All	Parameter	Episodic	Array	Numeric	mL/h	0..1	C91	C91
... MDC_HDIALY_PROFILE_TIME			Profile Times	This parameter is optional. If it is not present, the control points are assumed to be equally space across the total treatment time. If it is present, it is an array of numerical values that are the treatment times at which a control point takes effect.	All	Parameter	Episodic	Array	Numeric	min	0..1	C92	C92
... MDC_HDIALY_PROFILE_EXP_HALF_TIME			Exponential Half Time	This parameter is optional and only applies to the Exponential Profile. It specifies the time at which 50% of the change has been complete.	All	Parameter	Episodic	Numeric	Numeric	min	0..1	C93	C93
... MDC_HDIALY_PROFILE_NAME			Profile Name	Vendor specific profile name.	All	Parameter	Episodic	String	Alphanumeric	N/A	0..1	C94	C94
... MDC_HDIALY_PROFILE_PARAMETERS			Profile Parameters	Vendor specific parameters for a vendor specific profile.	All	Parameter	Episodic	Array	Numeric	N/A	0..1	C95	C95

Table 2 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
MDC_DEV_HDIALY_MACHINE_MDS (70929)											1..1	M	M
... MDC_ATTR_ID_MODEL (67880)		Dialysis Device	Dialysis Device Model and Manufacturer	String containing device model and manufacturer's name	All	Identifier	All	String	Alphanumeric	N/A	1..1	M	X

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Table 2 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
... MDC_ID_MODEL_MANUFACTURER (531970)		Dialysis Device	Dialysis Device Manufacturer	String containing device manufacturer's name (or use MDC_ATTR_ID_MODEL)	All	Identifier	All	String	Alphanumeric	N/A	1..1	M	X
... 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)	All	Identifier	All	String	Alphanumeric	N/A	1..1	M	X
... MDC_ID_PROD_SPEC_SERIAL (531972)		Dialysis Device	Dialysis Device Serial Number	String containing the device's serial number	All	Identifier	All	String	Alphanumeric	N/A	1..1	M	X
... MDC_ID_PROD_SPEC_SW (531975)		Dialysis Device	Device Software Version	String defining the version of the software on the machine	All	Identifier	All	String	Alphanumeric	N/A	1..1	M	X
... 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.]	All	Identifier	All	String	Alphanumeric	N/A	1..1	O	X
. MDC_DEV_HDIALY_VMD (70934)											1..1	M	M
.. MDC_DEV_HDIALY_MACH_CONFIG_CHAN (70939)											1..1	M	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)	All	Identifier	All	Time	YYYYMMDDHHMMSS[.SSS]+/-ZZZZ	N/A	1..1	M	X
... MDC_HDIALY_MACH_MODE_DESCRIPTION (158593)		Dialysis Device	Machine Mode Description	Manufacturer-specific description of the machine mode of operation	All	Parameter	Episodic	String	Alphanumeric	N/A	0..1	O	X
... MDC_HDIALY_MACH_MODE_OF_OPERATION (158594)		Dialysis Device	Machine Mode Of Operation	Process the machine is currently performing	All	Parameter	Episodic	<a href="#">TBL 01</a>	Alphanumeric	N/A	1..1	M	X
... MDC_TIME_PD_MAINTENANCE_TO_NEXT_SERVICE (184195)		Dialysis Device	Preventive Maintenance Time Remaining	Hours of operation remaining until next preventative maintenance is required	All	Status	Episodic	Numeric	XXXX	hours	0..1	O	X
... MDC_MAINTENANCE_NEXT_SERVICE_DATE (184199)		Dialysis Device	Preventative Maintenance Due Date	The date on which preventative maintenance is due.	All	State	Episodic	Date	YYYYMMDD	N/A	0..1	O	X
... MDC_HDIALY_MACH_MAINT_TX_REMAIN (158595)		Dialysis Device	Preventive Maintenance Treatments Remaining	Number of treatments remaining until next preventative maintenance is required	All	Status	Episodic	Numeric	XXXX	N/A	0..1	O	X

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Table 2 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
... MDC_HDIALY_MACH_BLD_PUMP_ON (158596)		Dialysis Device	Treatment Blood Pump On	Status indicating if blood pump is running	Intradialytic	Parameter	Episodic	Bool	T / F	N/A	1..1	M	X
... MDC_HDIALY_MACH_TX_FLUID_BYPASS (158597)		Dialysis Device	Treatment Fluid Bypass	Fluid pathway state to indicate if fluid is NOT flowing through dialyzer	Intradialytic	Parameter	Episodic	Bool	T / F	N/A	1..1	M	X
... MDC_HDIALY_MACH_TX_MODALITY (158598)		Dialysis Device	Treatment Modality	The way a patient receives dialysis	All	Parameter	Episodic	<a href="#">TBL_02</a>	Alphanumeric	N/A	1..1	M	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.	Intradialytic	Status	Periodic	Numeric	XXXX	minutes	1..1	M	X
... MDC_HDIALY_MACH_TIME_REMAIN (158724)		Dialysis Device State	Remaining Treatment Time	Number of minutes left for current dialysis session	Intradialytic	Status	Periodic	Numeric	XXXX	minutes	1..1	C10	X
... MDC_TEMP_ROOM (188508)		Dialysis Device State	Room Temperature	Room Temperature in which the Dialysis Machine is operating	All	Status	Periodic	Numeric	XX.X	°C	0..1	O	X
.. MDC_DEV_HDIALY_ANTICOAG_PUMP_CHAN (70943)											1..*	C1	C1
... 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.	Intradialytic	Parameter	Episodic	Numeric	X	N/A	1..1	M	M
... MDC_HDIALY_ANTICOAG_MODE (158600)		Anticoagulant Pump	Anticoagulation Mode	Method of anticoagulant administration during dialysis treatment	Intradialytic	Parameter	Episodic	<a href="#">TBL_03</a>	Alphanumeric	N/A	1..1	C4	M
... Profile Parameters				Anticoagulant Profile								C20	C20
... MDC_HDIALY_ANTICOAG_INFUS_RATE_SETTING (0)		Anticoagulant Pump	Anticoagulant Infusion Rate Setting	User defined amount of anticoagulation drug to be administered per unit time	Intradialytic	Parameter	Episodic	Numeric	XX.X	mL/h	0..1	C3	M
... MDC_HDIALY_ANTICOAG_INFUS_RATE (158736)		Anticoagulant Pump	Anticoagulant Infusion Rate	User defined amount of anticoagulation drug to be administered per unit time	Intradialytic	Parameter	Episodic	Numeric	XX.X	mL/h	0..1	C3	X
... MDC_HDIALY_ANTICOAG_ACCUM_DELIV (158728)		Anticoagulant Pump	Accumulated Delivered Anticoagulant	Total amount of anticoagulation drug administered to patient since the start of treatment	Intradialytic	Status	Both	Numeric	XXX.X	mL	0..1	C1	X
... 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	Intradialytic	Parameter	Episodic	Numeric	XX.X	mL	0..1	C2	O



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Table 2 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
... MDC_HDIALY_INFUS_TIME_SETTING (0)		<b>Anticoagulant Pump</b>	Anticoagulant Infusion Time Setting	User specified infusion time.	Intradialytic	Parameter	Episodic	Numeric	XXXX	minutes	0..1	O	O
... MDC_EVT_HDIALY_ANTICOAG_STOP (198236)	tech	<b>Anticoagulant Pump</b>	Anticoagulant Pump Stop	Notification that the anticoagulant pump has stopped	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O	X
... MDC_HDIALY_ANTICOAG_NAME (158599)		<b>Anticoagulant Pump</b>	Anticoagulant Type	Name of the anticoagulant	Intradialytic	Parameter	Episodic	String	Alphanumeric	N/A	0..1	O	M
... MDC_EVT_HDIALY_ANTICOAG_SYRINGE_EMPTY (198238)	tech	<b>Anticoagulant Pump</b>	Syringe Empty	Notification that the syringe plunger has reached the end of its functional range	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O	X
... MDC_HDIALY_ANTICOAG_SYRINGE_BRAND (158602)		<b>Anticoagulant Pump</b>	Syringe Name	Name of the syringe	Intradialytic	Parameter	Episodic	String	Alphanumeric	N/A	0..1	O	O
... MDC_HDIALY_ANTICOAG_SYRINGE_VOL (158603)		<b>Anticoagulant Pump</b>	Syringe Volume	Volume of the syringe with anticoagulant.	Intradialytic	Parameter	Episodic	Numeric	XXX	mL	0..1	O	O
... MDC_EVT_HDIALY_ANTICOAG_SYRINGE_SIZE (198240)	tech	<b>Anticoagulant Pump</b>	Wrong Syringe Size	Notification that the size of the syringe is not the size defined for anticoagulant administration	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O	X
... MDC_HDIALY_ANTICOAG_LOCATION (0)		<b>Anticoagulant Pump</b>	Anticoagulant Deliver Location	Location for delivery of the anticoagulant.	Intradialytic	Parameter	Episodic	<a href="#">TBL 16</a>	Alphanumeric	N/A	0..1	O	M
.. MDC_DEV_HDIALY_BLOOD_PUMP_CHAN (70947)											1..1	M	M
... MDC_HDIALY_BLD_PUMP_BLOOD_FLOW_RATE_SETTING (16935956)		<b>Blood Pump</b>	Blood Flow Rate Setting	The rate at which the user programmed the blood flow	Intradialytic	Parameter	Episodic	Numeric	XXX	mL/min	1..1	M	M
... MDC_HDIALY_BLD_PUMP_BLOOD_FLOW_RATE (158740)		<b>Blood Pump</b>	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	Intradialytic	Status	Periodic	numeric	XXX	mL/min	0..1	O	X
... MDC_HDIALY_BLD_PUMP_BLOOD_FLOW_RATE_MEAN (158743)		<b>Blood Pump</b>	Average Blood Flow Rate	Average of the actual blood flow rate over the course of treatment.	Intradialytic	Status	Periodic	Numeric	XXX	mL/min	0..1	O	X
... MDC_HDIALY_BLD_PRESS_ART (158744)	phys tech high low thr	<b>Blood Pump</b>	Arterial Pressure	Pressure of arterial access line pre blood pump	Intradialytic	Status	Periodic	Numeric	±XXX	mmHg	1..1	M	X
... MDC_HDIALY_BLD_PUMP_MODE (158604)		<b>Blood Pump</b>	Blood Pump Mode	Therapy method in which blood is retrieved and returned to the patient.	Intradialytic	Parameter	Episodic	<a href="#">TBL 05</a>	Alphanumeric	N/A	1..1	M	M
... MDC_EVT_HDIALY_BLD_PUMP_STOP (198242)	tech	<b>Blood Pump</b>	Blood Pump Stop	Notification that the blood pump has stopped	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	M	X
... MDC_HDIALY_BLD_PUMP_TUBING_SIZE (158605)		<b>Blood Pump</b>	Blood Tubing Size	Inner diameter of pump segment of tubing used in extracorporeal circulation	Intradialytic	Parameter	Episodic	String	alphanumeric	N/A	0..1	O	X

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Table 2 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
... MDC_HDIALY_BLOOD_TEMP_ART (158748)		<b>Blood Pump</b>	Arterial Blood Temperature	Arterial blood temperature as measured by the device.	Intradialytic	Status	Periodic	Numeric	XX.X	°C	0..1	O	X
... MDC_HDIALY_BLD_PUMP_CHANGE_IN_ENERGY (158752)		<b>Blood Pump</b>	Change In Energy	Measurement of the energy (temperate) flux to and from the patient	Intradialytic	Status	Periodic	Numeric	±XXX.X	kJ/h	0..1	O	X
... MDC_HDIALY_BLD_PUMP_PRESS_ART_POST_PUMP (158756)	tech high low thr	<b>Blood Pump</b>	Post Pump Arterial Pressure	Pressure of arterial access line post blood pump	Intradialytic	Status	Periodic	Numeric	±XXX	mmHg	0..1	O	X
... MDC_HDIALY_BLD_PUMP_PRIMING_VOL (158760)		<b>Blood Pump</b>	Priming Volume	Volume of fluid used to prime the extracorporeal circuit	Intradialytic	Parameter	Episodic	Numeric	XXX	mL	0..1	O	X
... MDC_HDIALY_BLD_PUMP_SINGLE_NEEDLE_PRESS (158764)	tech high low thr	<b>Blood Pump</b>	Single Needle Switching Pressure	In single needle mode, the pressure used to switch phases at high pressure	Intradialytic	Parameter	Episodic	Numeric	± XXX	mmHg	0..1	O	X
... MDC_HDIALY_BLD_PUMP_STROKE_VOL (158768)		<b>Blood Pump</b>	Stroke Volume	The volume of blood passing through the dialyzer during each single needle cycle.	Intradialytic	Status	Periodic	Numeric	XXX	mL	0..1	C5	X
... MDC_HDIALY_BLD_PUMP_BLOOD_PROCESSED_TOTAL (158772)		<b>Blood Pump</b>	Total Blood Processed	Accumulated volume of blood circulated by extracorporeal circulation.	Intradialytic	Status	Periodic	Numeric	XXXX.XX	L	0..1	O	X
... MDC_HDIALY_BLD_PUMP_PRESS_VEN (158776)	phys tech high low thr	<b>Blood Pump</b>	Venous Pressure	Pressure of the venous access line	Intradialytic	Status	Periodic	Numeric	±XXX	mmHg	1..1	M	X
... MDC_HDIALY_BLOOD_TEMP_VEN (158780)		<b>Blood Pump</b>	Venous Temperature	Temperature of the blood measured in the venous access line	Intradialytic	Status	Periodic	Numeric	XX.X	°C	0..1	O	X
... MDC_HDIALY_BLOOD_TEMP_VEN_SETTING (16935996)		<b>Blood Pump</b>	Venous Temperature Setting	Desired temperature of the blood in the venous access line	Intradialytic	Status	Periodic	Numeric	XX.X	°C	0..1	O	O
<b>.. MDC_DEV_HDIALY_FLUID_CHAN (70951)</b>											<b>1..1</b>	<b>C6</b>	<b>C6</b>
... MDC_HDIALY_DIALYSATE_FLOW_MODE (158606)		<b>Dialysis Fluid</b>	Dialysate Flow Mode	The mode of controlling dialysate flow rate	All	Parameter	Episodic	<a href="#">TBL 06</a>	alphanumeric	N/A	1..1	C6	M
... Profile Parameters				Dialysate pump profile parameters								C22	C22
... MDC_HDIALY_DIALYSATE_FLOW_RATE_SETTING (16936008)		<b>Dialysis Fluid</b>	Dialysate Flow Rate Setting	Rate at which the user programmed the dialysate flow	Intradialytic	Parameter	Episodic	Numeric	XXXX	mL/min	0..1	C6	M
... MDC_HDIALY_DIALYSATE_FLOW_RATE (158792)	tech low	<b>Dialysis Fluid</b>	Actual Dialysate Flow Rate	Rate of dialysate flow at any given point during a treatment	Intradialytic	Status	Periodic	Numeric	XXXX	mL/min	1..1	C6	X
... MDC_HDIALY_DIALYSATE_VOL_DELIV (158848)		<b>Dialysis Fluid</b>	Total Dialysate Volume	Total amount of dialysate delivered to patient during a treatment	Intradialytic	Status	Periodic	Numeric	XXX.XX	L	0..1	O	X
... MDC_HDIALY_DIALYSATE_VOL_DELIV_SETTING (0)		<b>Dialysis Fluid</b>	Dialysate Volume Setting	User programmed dialysate volume to deliver	Intradialytic	Parameter	Episodic	Numeric	XXX.XX	L	0..1	O	O

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REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
... MDC_HDIALY_DIALYSA TE_NAME (158608)		Dialysis Fluid	Dialysate Name	String containing a descriptive name of the dialysate	Intradialytic	Parameter	Episodic	String	Alphanumeric	N/A	1..1	O	M
... MDC_HDIALY_BICARB_COND (158784)		Dialysis Fluid	Actual Bicarbonate Conductivity	Measured conductivity of bicarbonate	Intradialytic	Status	Periodic	Numeric	XX.XX	mS/cm	0..1	O	X
... MDC_HDIALY_BICARB_COND_SETTING (16936000)		Dialysis Fluid	Bicarbonate Conductivity Setting	Bicarbonate conductivity	Intradialytic	Parameter	Episodic	Numeric	XX.XX	mS/cm	0..1	O	X
... MDC_HDIALY_DIALYSA TE_COND (158788)	tech high low	Dialysis Fluid	Actual Conductivity	Measured conductivity of dialysate	Intradialytic	Status	Periodic	Numeric	XX.XX	mS/cm	1..1	C12	X
... MDC_HDIALY_DIALYSA TE_COND_SETTING (16936004)		Dialysis Fluid	Dialysate Conductivity Setting	Acid and Bicarbonate conductivity combined	Intradialytic	Parameter	Episodic	Numeric	XX.XX	mS/cm	0..1	O	X
... MDC_HDIALY_DIALYSA TE_TEMP (158796)	tech high low	Dialysis Fluid	Actual Dialysate Temperature	Temperature of dialysate	Intradialytic	Status	Periodic	Numeric	XX.X	°C	1..1	O	X
... MDC_HDIALY_DIALYSA TE_TEMP_SETTING (16936012)		Dialysis Fluid	Dialysate Temperature Setting	Temperature at which dialysate is to be delivered to patient	Intradialytic	Parameter	Episodic	Numeric	XX.X	°C	1..1	O	O
... MDC_HDIALY_DIALYSA TE_AMMONIA (158800)		Dialysis Fluid	Ammonia Concentration	Measured ammonia concentration of the dialysate	Intradialytic	Status	Periodic	Numeric	XX.XX	ppm	0..1	O	X
... MDC_HDIALY_DIALYSA TE_FLOW_RATE_MEAN (158795)		Dialysis Fluid	Average Dialysate Flow Rate	Average rate of dialysate flow during course of treatment	Intradialytic	Status	Periodic	Numeric	XXXX	mL/min	0..1	O	X
... MDC_HDIALY_CONC_H CO3_SETTING (16936020)		Dialysis Fluid	Bicarbonate Concentration Setting	User programmed Bicarbonate concentration in dialysate.	Intradialytic	Parameter	Episodic	Numeric	XXX.X	mmol/L	1..1	O	O
... MDC_HDIALY_CONC_H CO3_MODE (158607)		Dialysis Fluid	Bicarbonate Mode	Process for delivering adjusted bicarbonate concentration in dialysate	Intradialytic	Parameter	Episodic	<a href="#">TBL 14</a>	Alphanumeric	N/A	1..1	O	O
... MDC_EVT_HDIALY_BLO OD_LEAK (198244)	tech	Dialysis Fluid	Blood Leak	Notification that blood has been detected in the dialysate fluid	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	M	X
... MDC_HDIALY_DIALYSA TE_CONC_ACETATE (158808)		Dialysis Fluid	Dialysate Acetate Concentration	Acetate concentration in dialysate	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O	X
... MDC_HDIALY_DIALYSA TE_CONC_HCO3 (158812)		Dialysis Fluid	Dialysate Bicarbonate Concentration	Bicarbonate concentration in dialysate	Intradialytic	Parameter	Episodic	Numeric	XXX.X	mmol/L	0..1	O	X
... MDC_HDIALY_DIALYSA TE_CONC_CHLORIDE (158816)		Dialysis Fluid	Dialysate Chloride Concentration	Chloride concentration in dialysate	Intradialytic	Parameter	Episodic	Numeric	XXX	mmol/L	0..1	O	X
... MDC_HDIALY_DIALYSA TE_CONC_MG (158820)		Dialysis Fluid	Dialysate Magnesium Concentration	Magnesium concentration in dialysate	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O	X

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REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
... MDC_HDIALY_DIALYSA TE_CONC_CA (158824)		Dialysis Fluid	Dialysate Calcium Concentration	Calcium concentration in dialysate	Intradialytic	Parameter	Episodic	Numeric	X.XX	mmol/L	0..1	O	X
... MDC_HDIALY_DIALYSA TE_CONC_CITRATE (158828)		Dialysis Fluid	Dialysate Citrate Concentration	Citrate concentration in dialysate	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O	X
... MDC_HDIALY_DIALYSA TE_CONC_GLU (158832)		Dialysis Fluid	Dialysate Glucose Concentration	Glucose concentration in dialysate	Intradialytic	Parameter	Episodic	Numeric	XXX	mmol/L	0..1	O	X
... MDC_HDIALY_DIALYSA TE_CONC_K (158836)		Dialysis Fluid	Dialysate Potassium Concentration	Potassium concentration in dialysate	Intradialytic	Parameter	Episodic	Numeric	X.X	mmol/L	0..1	O	X
... MDC_HDIALY_DIALYSA TE_CONC_NA (158840)		Dialysis Fluid	Dialysate Sodium Concentration	Sodium concentration in dialysate	Intradialytic	Parameter	Episodic	Numeric	XXXX	mmol/L	0..1	O	X
... MDC_HDIALY_DIALYSA TE_CONC_NA_SETTING (16936056)		Dialysis Fluid	Dialysate Sodium concentration Setting	User programmed sodium concentration in dialysate	Intradialytic	Parameter	Episodic	Numeric	XXXX	mmol/L	1..1	O	O
... MDC_HDIALY_DIALYSA TE_CONC_NA_MODE (158609)		Dialysis Fluid	Dialysate Sodium Mode	Process for delivering adjusted sodium concentration in dialysate	Intradialytic	Parameter	Episodic	<a href="#">TBL 15</a>	Alphanumeric	N/A	1..1	O	O
... Profile Parameters				Sodium Mode								C23	C23
... MDC_HDIALY_DIALYSA TE_CONC_PH (158844)		Dialysis Fluid	pH	Measured pH of the dialysate	Intradialytic	Status	Periodic	Numeric	XX.X	pH	0..1	O	X
<b>.. MDC_DEV_HDIALY_FILTER_CHAN (70955)</b>											<b>1..1</b>	<b>M</b>	<b>M</b>
... MDC_HDIALY_FILTER_NAME (158610)		Filter (Dialyzer)	Dialyzer Name	Dialyzer manufacturer and model	Intradialytic	Parameter	Episodic	String	Alphanumeric	N/A	0..1	O	M
... 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	Intradialytic	Status	Periodic	Numeric	±XXX	mmHg	1..1	M	X
... MDC_HDIALY_FILTER_NUMBER (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.	Intradialytic	Status	Periodic	Numeric	X	N/A	0..1	O	X
... MDC_HDIALY_FILTER_UDI (158612)		Filter (Dialyzer)	Filter UDI	The UDI for the current filter.	Intradialytic	Status	Periodic	String	N/A	N/A	0..1	O	X
<b>.. MDC_DEV_HDIALY_CONVECTIVE_CHAN (70959)</b>											<b>1..1</b>	<b>C8</b>	<b>C8</b>
... MDC_HDIALY_RF_DILUTION_LOCATION (158613)		Replacement Fluid	Replacement Fluid Dilution Location	Delivery location of the replacement fluid	Intradialytic	Parameter	Episodic	<a href="#">TBL 08</a>	Alphanumeric	N/A	1..1	C8	M
... MDC_HDIALY_RF_FLOW_MODE (158616)		Replacement Fluid	Replacement Fluid Flow Mode	The mode of controlling replacement fluid flow rate	All	Parameter	Episodic	<a href="#">TBL 07</a>	Alphanumeric	N/A	1..1	C8	C8

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REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
... Profile Parameters				RF Delivery profile parameters								C24	C24
... MDC_HDIALY_RF_POST_FILTER_FLUID_NAME (158614)		<b>Replacement Fluid</b>	Post Filter Replacement Fluid Name	String containing a descriptive name of the post-filter replacement fluid	Intradialytic	Parameter	Episodic	String	Alphanumeric	N/A	1..1	O	C7
... MDC_HDIALY_RF_POST_FILTER_CONC_ACETATE (158856)		<b>Replacement Fluid</b>	Post-Filter RF Acetate Concentration	Acetate concentration in the post-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O	X
... MDC_HDIALY_RF_POST_FILTER_CONC_HCO3 (158860)		<b>Replacement Fluid</b>	Post-Filter RF Bicarbonate Concentration	Bicarbonate concentration in the post-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	XXX.X	mmol/L	0..1	O	X
... MDC_HDIALY_RF_POST_FILTER_CONC_CHLORIDE (158864)		<b>Replacement Fluid</b>	Post-Filter RF Chloride Concentration	Chloride concentration in the post-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	XXX	mmol/L	0..1	O	X
... MDC_HDIALY_RF_POST_FILTER_CONC_MG (158868)		<b>Replacement Fluid</b>	Post-Filter RF Magnesium Concentration	Magnesium concentration in the post-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O	X
... MDC_HDIALY_RF_POST_FILTER_CONC_CA (158872)		<b>Replacement Fluid</b>	Post-Filter RF Calcium Concentration	Calcium concentration in the post-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	X.XX	mmol/L	0..1	O	X
... MDC_HDIALY_RF_POST_FILTER_CONC_CITRATE (158876)		<b>Replacement Fluid</b>	Post-Filter RF Citrate Concentration	Citrate concentration in the post-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O	X
... MDC_HDIALY_RF_POST_FILTER_CONC_GLU (158880)		<b>Replacement Fluid</b>	Post-Filter RF Glucose Concentration	Glucose concentration in the post-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	XXX	mmol/L	0..1	O	X
... MDC_HDIALY_RF_POST_FILTER_CONC_K (158884)		<b>Replacement Fluid</b>	Post-Filter RF Potassium Concentration	Potassium concentration in the post-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	X.X	mmol/L	0..1	O	X
... MDC_HDIALY_RF_POST_FILTER_CONC_NA (158888)		<b>Replacement Fluid</b>	Post-Filter RF Sodium Concentration	Sodium concentration in the post-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	XXXX	mmol/L	0..1	O	X
... MDC_HDIALY_RF_POST_FILTER_FLOW_RATE_SETTING (16936108)		<b>Replacement Fluid</b>	Post-Filter Replacement Fluid Flow Rate Setting	Rate at which the user programmed the post-filter replacement fluid flow	Intradialytic	Parameter	Episodic	Numeric	XXXX	mL/min	0..1	C7	C7
... MDC_HDIALY_RF_POST_FILTER_FLOW_RATE (158892)		<b>Replacement Fluid</b>	Actual Post-Filter Replacement Fluid Flow Rate	Rate of post-filter replacement fluid flow at any given point during a treatment	Intradialytic	Status	Periodic	Numeric	XXXX	mL/min	1..1	C7	X
... MDC_HDIALY_RF_POST_FILTER_FLOW_RATE_MEAN (158895)		<b>Replacement Fluid</b>	Average Post-Filter Replacement Fluid Flow Rate	Average rate of post-filter replacement fluid flow during course of treatment.	Intradialytic	Status	Periodic	Numeric	XXXX	mL/min	0..1	O	X

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REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
... 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	Intradialytic	Parameter	Episodic	Numeric	XXX.XX	L	0..1	O	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	Intradialytic	Status	Periodic	Numeric	XXX.XX	L	0..1	O	X
... 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	Intradialytic	Parameter	Episodic	Numeric	XX.X	°C	1..1	C7	O
... MDC_HDIALY_RF_POST_FILTER_TEMP (158896)		Replacement Fluid	Actual Post-Filter Replacement Fluid Temperature	Temperature of post-filter replacement fluid	Intradialytic	Status	Periodic	Numeric	XX.X	°C	1..1	C7	X
... MDC_HDIALY_RF_PRE_FILTER_FLUID_NAME (158615)		Replacement Fluid	Pre-Filter RF Name	String containing a descriptive name of the pre-filter replacement fluid	Intradialytic	Parameter	Episodic	String	Alphanumeric	N/A	1..1	O	C16
... MDC_HDIALY_RF_PRE_FILTER_CONC_ACETATE (158904)		Replacement Fluid	Pre-Filter RF Acetate Concentration	Acetate concentration in the pre-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O	X
... MDC_HDIALY_RF_PRE_FILTER_CONC_HCO3 (158908)		Replacement Fluid	Pre-Filter RF Bicarbonate Concentration	Bicarbonate concentration in the pre-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	XXX.X	mmol/L	0..1	O	X
... MDC_HDIALY_RF_PRE_FILTER_CONC_CHLORIDE (158912)		Replacement Fluid	Pre-Filter RF Chloride Concentration	Chloride concentration in the pre-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	XXX	mmol/L	0..1	O	X
... MDC_HDIALY_RF_PRE_FILTER_CONC_MG (158916)		Replacement Fluid	Pre-Filter RF Magnesium Concentration	Magnesium concentration in the pre-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O	X
... MDC_HDIALY_RF_PRE_FILTER_CONC_CA (158920)		Replacement Fluid	Pre-Filter RF Calcium Concentration	Calcium concentration in the pre-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	X.XX	mmol/L	0..1	O	X
... MDC_HDIALY_RF_PRE_FILTER_CONC_CITRATE (158924)		Replacement Fluid	Pre-Filter RF Citrate Concentration	Citrate concentration in the pre-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	XX.X	mmol/L	0..1	O	X
... MDC_HDIALY_RF_PRE_FILTER_CONC_GLU (158928)		Replacement Fluid	Pre-Filter RF Glucose Concentration	Glucose concentration in the pre-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	XXX	mmol/L	0..1	O	X
... MDC_HDIALY_RF_PRE_FILTER_CONC_K (158932)		Replacement Fluid	Pre-Filter RF Potassium Concentration	Potassium concentration in the pre-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	X.X	mmol/L	0..1	O	X
... MDC_HDIALY_RF_PRE_FILTER_CONC_NA (158936)		Replacement Fluid	Pre-Filter RF Sodium Concentration	Sodium concentration in the pre-filter replacement fluid	Intradialytic	Parameter	Episodic	Numeric	XXXX	mmol/L	0..1	O	X

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REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
... 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	Intradialytic	Parameter	Episodic	Numeric	XXXX	mL/min	0..1	C8	C16
... 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	Intradialytic	Status	Periodic	Numeric	XXXX	mL/min	1..1	C7	X
... 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.	Intradialytic	Status	Periodic	Numeric	XXXX	mL/min	0..1	O	X
... 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	Intradialytic	Parameter	Episodic	Numeric	XXX.XX	L	0..1	O	C16
... 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	Intradialytic	Status	Periodic	Numeric	XXX.XX	L	0..1	O	X
... 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	Intradialytic	Parameter	Episodic	Numeric	XX.X	°C	1..1	C7	O
... MDC_HDIALY_RF_PRE_FILTER_TEMP (158944)		Replacement Fluid	Actual Pre-Filter Replacement Fluid Temperature	Temperature of pre-filter replacement fluid	Intradialytic	Status	Periodic	Numeric	XX.X	°C	1..1	C7	X
... 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"	Intradialytic	Status	Periodic	Numeric	XXX.X	mL/min	0..1	O	X
... 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	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O	X
... 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	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O	X

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REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
... MDC_HDIALY_RF_PRE_POST_FLOW_RATIO_SETTING (16936172)		<b>Replacement Fluid</b>	Pre-Post Replacement Fluid Flow Rate Ratio Setting	The ratio desired between the pre and post Replacement Fluid Flow Rate Settings	Intradialytic	Parameter	Episodic	Numeric	XX.X	N/A	0..1	O	O
... MDC_HDIALY_RF_BOLUS_RATE (158960)	tech high low	<b>Replacement Fluid</b>	Replacement Fluid Bolus Rate	User defined replacement fluid bolus rate.	Intradialytic	Parameter	Episodic	Numeric	XXXX	mL/min	0..1	C9	X
... MDC_HDIALY_RF_BOLUS_VOL_SETTING (16936180)		<b>Replacement Fluid</b>	Replacement Fluid Bolus Volume Setting	User defined amount of replacement fluid to be delivered in this single large dose	Intradialytic	Parameter	Episodic	Numeric	XXX	mL	0..1	C9	O
... MDC_HDIALY_RF_BOLUS_VOL_DELIVERED (158968)	tech high low	<b>Replacement Fluid</b>	Replacement Fluid Bolus Volume Delivered	Amount of replacement fluid delivered in a single large dose.	Intradialytic	Parameter	Episodic	Numeric	XXX	mL	0..1	C9	X
... MDC_HDIALY_RF_SOURCE (158617)		<b>Replacement Fluid</b>	Replacement Fluid Source	The source of the replacement fluid.	Intradialytic	Status	Episodic	<a href="#">TBL 09</a>	Alphanumeric	N/A	0..1	O	X
... MDC_EVT_HDIALY_RF_BOLUS (198250)		<b>Replacement Fluid</b>	Replacement Fluid Bolus Event	True when an RF Bolus is occurring.	Intradialytic	Status	Episodic	Bool	T / F	N/A	0..1	C9	X
<b>... MDC_DEV_HDIALY_SAFETY_SYSTEMS_CHAN (70963)</b>											<b>1..1</b>	<b>M</b>	<b>X</b>
... MDC_EVT_HDIALY_SAFETY_ART_AIR_DETECT (198252)	tech	<b>Safety Systems</b>	Arterial Air Detector	Notification that air is sensed in the arterial blood lines	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	M	X
... MDC_EVT_HDIALY_SAFETY_DIALYSATE_AIR_DETECT (198254)	tech	<b>Safety Systems</b>	Dialysate Air Detector	Notification that air is sensed in dialysate line	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	C6	X
... MDC_EVT_HDIALY_SAFETY_DIALYSATE_COMPOSITION (198256)	tech	<b>Safety Systems</b>	Dialysis Composition	Notification that the dialyzing fluid composition is incorrect	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O	X
... MDC_EVT_HDIALY_SAFETY_SYSTEM_GENERAL (198258)	tech	<b>Safety Systems</b>	General System	Notification of any dialysis machine malfunction that are not related to patient treatment	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	M	X
... MDC_EVT_SELFTEST_FAILURE (198216)	tech	<b>Safety Systems</b>	Self-Test	Notification that a self-test failed	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	M	X
... MDC_EVT_HDIALY_SAFETY_VEN_ACCESS (198260)	tech	<b>Safety Systems</b>	Venous Access	Notification that the venous access may have become disconnected	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O	X
... MDC_EVT_HDIALY_SAFETY_VEN_AIR_DETECT (198262)	tech	<b>Safety Systems</b>	Venous Air Detector	Notification that air is sensed in the venous blood lines	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	M	X
... MDC_EVT_HDIALY_SAFETY_WETNESS_DETECT_ALERT (198264)	tech	<b>Safety Systems</b>	Wetness Detector	Notification that the wetness detector has sensed fluid	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O	X



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Table 2 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
... MDC_EVT_HDIALY_SAFETY_WETNESS_DETECT_ERROR (198266)	tech	Safety Systems	Wetness Detector Error	Notification of a detected error on the wetness detector device	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O	X
... 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.	Intradialytic	Status	Episodic	Numeric	XXXX	N/A	0..1	O	X
... 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.	Intradialytic	Status	Episodic	String	N/A	N/A	0..1	O	X
.. MDC_DEV_HDIALY_THERAPY_OUTCOMES_CHANNEL (70967)											1..1	M	M
... MDC_HDIALY_THERAPY_MASS_TRF_AREA_COEFF (158972)		Therapy Outcomes	KoA	Overall mass transfer coefficient multiplied by surface area of a dialyzer	Intradialytic	Status	Episodic	Numeric	XXXX	N/A	0..1	O	X
... MDC_HDIALY_THERAPY_ACCESS_FLOW (158976)		Therapy Outcomes	Access Flow	Flow through a fistula or other conduit connecting an artery to a vein	Intradialytic	Status	Periodic	Numeric	±XXXX	mL/min	0..1	O	X
... MDC_HDIALY_THERAPY_RATIO_KT_OVER_V_GOAL (158992)		Therapy Outcomes	Kt/V Goal	Target dialysis treatment adequacy measurement	Intradialytic	Parameter	Episodic	Numeric	X.XX	%	0..1	O	C17
... MDC_HDIALY_THERAPY_UREA_CLEARANCE_MEAN (159019)		Therapy Outcomes	Mean Urea Clearance	Time weighted average of the individual effective conductivity clearance measurements	Intradialytic	Status	Episodic	Numeric	XXX	N/A	0..1	O	X
... 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.	Intradialytic	Status	Episodic	Numeric	XXX	N/A	0..1	O	X
... MDC_HDIALY_THERAPY_UREA_DISTRIBUTION_VOLUME_SETTING (0)		Therapy Outcomes	Urea Distribution Volume Setting	User setting for urea distribution volume used as V in the equation Kt/V.	All	Parameter	Episodic	Numeric	X.XX	L	0..1	O	O
... MDC_HDIALY_THERAPY_KT_DELIVERED (158984)		Therapy Outcomes	Delivered Kt	Volume of fluid cleared of urea by dialysis treatment	Intradialytic	Status	Episodic	Numeric	X.XX	L	0..1	O	X
... 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	Intradialytic	Status	Episodic	Numeric	X.XX	%	0..1	O	X

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Table 2 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
... MDC_HDIALY_THERAPY_RATIO_SPKT_OVER_V_DELIVERED (158988)		<b>Therapy Outcomes</b>	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	Intradialytic	Status	Episodic	Numeric	X.XX	%	0..1	O	X
... MDC_HDIALY_THERAPY_RATIO_SPKT_OVER_V_PROJECTED (159012)		<b>Therapy Outcomes</b>	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	Intradialytic	Status	Episodic	Numeric	X.XX	%	0..1	O	X
... MDC_EVT_HDIALY_THERAPY_PAT_TX_GENERAL (198268)	phys	<b>Therapy Outcomes</b>	General Patient Treatment	Notification that the machine has detected an alarm condition not covered by other alarms that is related to patient treatment.	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O	X
... MDC_HDIALY_THERAPY_PCT_RECIRC (159004)		<b>Therapy Outcomes</b>	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.	Intradialytic	Status	Periodic	Numeric	±XXX.X	%	0..1	O	X
... MDC_HDIALY_THERAPY_PLASMA_NA_CONC (159008)		<b>Therapy Outcomes</b>	Plasma Sodium Concentration	Sodium ion concentration measured in patient plasma.	Intradialytic	Status	Episodic	Numeric	XXX	mmol/L	0..1	O	X
... MDC_HDIALY_THERAPY_COMPLETE_METHOD (158618)		<b>Therapy Outcomes</b>	Treatment Completion Method	Parameter used to determine when treatment has been complete	Intradialytic	Status	Episodic	<a href="#">TBL 12</a>	Alphanumeric	N/A	1..1	M	M
... MDC_EVT_HDIALY_THERAPY_TX_END_TIME (198270)	tech	<b>Therapy Outcomes</b>	Treatment Time Ended	Notification that target time of treatment has been met	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O	X
... MDC_HDIALY_THERAPY_BODY_START_WT (159000)		<b>Therapy Outcomes</b>	Patient Start Weight	Weight of patient at beginning of treatment	All	Parameter	Episodic	Numeric	XXX.X	Kg	0..1	O	X
... MDC_HDIALY_THERAPY_BODY_END_WT (159020)		<b>Therapy Outcomes</b>	Patient End Weight	Weight of patient at end of treatment	All	Parameter	Episodic	Numeric	XXX.X	Kg	0..1	O	X

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REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
... MDC_HDIALY_THERAPY_BODY_END_WT_SETTING (0)		<b>Therapy Outcomes</b>	Patient End Weight Target	Desired weight of patient at end of treatment. This is present as a means to specify UF when patient weight is changing. Requires patient's pre-treatment weight which could come from patient, scale, or EMR.	All	Parameter	Episodic	Numeric	XXX.X	Kg	0..1	O	O
... MDC_HDIALY_THERAPY_END_TIME_SETTING (0)		<b>Therapy Outcomes</b>	Treatment End Time	The clock time that the therapy ends when completion method is Clock Time,	All	Parameter	Episodic	Time	YYYYMMDDHHMMSS[.SSS]+/-ZZZZ	N/A	0..1	O	C14
... MDC_HDIALY_THERAPY_TX_TIME_SETTING (0)		<b>Therapy Outcomes</b>	Treatment Time	The duration of the therapy when completion method is Tx Time.	All	Parameter	Episodic	Numeric	XXXX	minutes	0..1	O	C15
.. MDC_DEV_HDIALY_UF_CHAN (70971)											1..1	M	M
... MDC_HDIALY_UF_MODE (158619)		<b>Ultrafiltration System</b>	Ultrafiltration Mode	Process used to remove fluid volume from the patient	Intradialytic	Parameter	Episodic	<a href="#">TBL 13</a>	Alphanumeric	N/A	1..1	M	M
... Profile Parameters				UF Profile parameters								C19	C19
... MDC_HDIALY_UF_RATE_SETTING (16936252)		<b>Ultrafiltration System</b>	Ultrafiltration Rate	Rate at which fluid is removed from the patient For systems that compute this value using Treatment Time and UF Target, this value would be reported as an Automatic Setting (ASET).	Intradialytic	Status	Periodic	Numeric	XXXX	mL/h	1..1	M	C18
... MDC_HDIALY_UF_RATE (159036)		<b>Ultrafiltration System</b>	Ultrafiltration Rate	Current rate at which fluid is removed from the patient	Intradialytic	Status	Periodic	Numeric	XXXX	mL/h	1..1	M	X
... MDC_EVT_HDIALY_UF_LO (198272)	tech-low	<b>Ultrafiltration System</b>	Insufficient Ultrafiltration	Notification that the ultrafiltration system is not removing as much fluid as intended	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O	X
... MDC_EVT_HDIALY_UF_NEG (198274)	tech-low	<b>Ultrafiltration System</b>	Negative Ultrafiltration	Notification that the ultrafiltration system has resulted in a negative ultrafiltration rate	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O	X
... MDC_HDIALY_UF_TIME_TO_TARGET (159024)		<b>Ultrafiltration System</b>	Remaining Ultrafiltration Time	Time remaining until target volume to remove will have been achieved.	Intradialytic	Status	Periodic	Numeric	XXXX	minutes	0..1	O	X
... MDC_HDIALY_UF_TARGET_VOL_TO_REMOVE (159028)		<b>Ultrafiltration System</b>	Target Volume To Remove	Planned fluid removal	Intradialytic	Parameter	Episodic	Numeric	XXXX	mL	1..1	C11	C11
... MDC_HDIALY_UF_ACTUAL_REMOVED_VOL (159032)		<b>Ultrafiltration System</b>	Total Fluid Volume Removed	Measured fluid removed from patient	Intradialytic	Status	Periodic	Numeric	XXXX	mL	1..1	M	X

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Table 2 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
... MDC_EVT_HDIALY_UF_RATE_RANGE (198276)	tech-range	<b>Ultrafiltration System</b>	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	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	M	X
... MDC_EVT_HDIALY_UF_GOAL_MET (198278)	tech	<b>Ultrafiltration System</b>	Ultrafiltration Goal Met	Notification that target ultrafiltration volume has been met	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O	X
... MDC_HDIALY_UF_RATE_LIMIT_HIGH_SETTING (16936257)		<b>Ultrafiltration System</b>	UF Rate Upper Limit	Maximum ultrafiltration rate allowed without an alarm generation.	Intradialytic	Parameter	Episodic	Numeric	XXXX	mL/h	0..1	O	X
... MDC_HDIALY_UF_RATE_LIMIT_LOW_SETTING (16936259)		<b>Ultrafiltration System</b>	UF Rate Lower Limit	Maximum ultrafiltration rate allowed without an alarm generation.	Intradialytic	Parameter	Episodic	Numeric	XXXX	mL/h	0..1	O	X
. MDC_DEV_PRESS_BLD_NONINV_VMD (70686)				<b>Non-Invasive Blood Pressure Monitor</b>							0..1	O	O
.. MDC_DEV_PRESS_BLD_NONINV_CHAN (70687)											0..1	O	O
... MDC_ATTR_TIME_PD_MSMT (67979)		<b>Blood Pressure Monitor</b>	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.	All	Parameter	Episodic	Numeric	XXX	minutes	0..1	O	X
... MDC_ATTR_PT_BODY_POSN (68135)		<b>Blood Pressure Monitor</b>	Blood Pressure Measurement Position	Patient position at time of blood pressure measurement	All	Blood Pressure	Episodic	<a href="#">TBL 04</a>	Alphanumeric	N/A	0..1	O	X
... MDC_PRESS_BLD_NONINV_DIA (150022)	phys high low thr	<b>Blood Pressure Monitor</b>	Diastolic Pressure	Minimum arterial pressure during relaxation and dilatation of the ventricles of the heart when the ventricles fill with blood	All	Blood Pressure	Episodic	Numeric	XXX	mmHg	0..1	O	C13
... MDC_PULS_RATE_NONINV (149546)	phys high low thr	<b>Blood Pressure Monitor</b>	Heart Rate	Number of heart beats per minute	All	Blood Pressure	Episodic	Numeric	XXX	beats/min	0..1	O	C13
... MDC_PRESS_BLD_NONINV_MEAN (150023)		<b>Blood Pressure Monitor</b>	Mean Arterial Pressure	Average pressure in a patient's arteries during one cardiac cycle	All	Blood Pressure	Episodic	Numeric	XXX	mmHg	0..1	O	C13
... MDC_PRESS_BLD_NONINV_SYS (150021)	phys high low thr	<b>Blood Pressure Monitor</b>	Systolic Pressure	Maximum arterial pressure during contraction of the left ventricle of the heart	All	Blood Pressure	Episodic	Numeric	XXX	mmHg	0..1	O	C13

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Table 2 – Dialysis Machine Data Objects

REFID	Alert Type	Dialysis Device VMD	Dialysis Common Name	Definition	Phase	Message	Temporal	Data Type	Format	UOM	CARD	USE	Rx Use
. MDC_DEV_ANALY_SAT_O2_VMD (69642)											0..1	O	O
.. MDC_DEV_ANALY_SAT_O2_CHAN (69643)											0..1	O	O
... MDC_PULS_OXIM_SAT_O2 (150456)	phys high low thr	<b>Pulse Oximeter Monitor</b>	SpO2 Oxygen Saturation	Hemoglobin oxygen saturation in patient blood measured by pulse oximetry	Intradialytic	SpO2	Periodic	Numeric	XXX	%	0..1	O	C13
... MDC_PULS_OXIM_PULS_RATE (149530)	phys high low thr	<b>Pulse Oximeter Monitor</b>	SpO2 Pulse Rate	Number of heart beats per minute measured by pulse oximetry	Intradialytic	SpO2 Pulse Rate	Periodic	Numeric	XXX	beats/min	0..1	O	C13
... MDC_EVT_ERR (196638)	tech	<b>Safety Systems</b>	Pulse Oximeter Error	Notification of a detected error on the pulse oximeter device	Intradialytic	Alert	Episodic	Bool	T / F	N/A	0..1	O	X
. MDC_DEV_BLOOD_CHEM_VMD (70974)											0..1	O	X
.. MDC_DEV_BLOOD_CHEM_CHAN (70975)				<b>Blood Chemistry Channel</b>							0..1	O	X
... MDC_HDIALY_PLASMA_VOL_MARKER (158620)		<b>Therapy Outcomes</b>	Plasma Volume Marker	An indicator applied to the blood volume percent reading to designate an event	Intradialytic	Status	Periodic	<a href="#">TBL 10</a>	Alphanumeric	N/A	0..1	O	X
... MDC_HDIALY_PLASMA_VOL_PROFILE (158621)		<b>Therapy Outcomes</b>	Plasma Volume Profile	The rate of change in relative blood volume.	Intradialytic	Status	Periodic	<a href="#">TBL 11</a>	Alphanumeric	N/A	0..1	O	X
... MDC_CONC_HCT_GEN (160132)	phys low high thr	<b>Therapy Outcomes</b>	Hematocrit	100*(sample red blood cell volume/blood sample volume)	Intradialytic	Status	Periodic	Numeric	XX.X	%{vol}	0..1	O	X
... MDC_CONC_HB_GEN (160120)	phys low high thr	<b>Therapy Outcomes</b>	Hemoglobin	Concentration of hemoglobin in a sample expressed as mass/volume	Intradialytic	Status	Periodic	Numeric	±XXX.X	g/dL	0..1	O	X
... MDC_HDIALY_REL_BLOOD_VOL (159044)	phys low thr	<b>Therapy Outcomes</b>	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: $\Delta BV\% = [(H0/H1) - 1] \times 100$ Where H0 = initial Hct or Hb H1 = current Hct or Hb	Intradialytic	Alert	Episodic	Numeric	XXX.X	%	0..1	O	X
... MDC_SAT_O2 (150316)	phys low high thr	<b>Therapy Outcomes</b>	SpO2 Oxygen Saturation	Hemoglobin oxygen saturation in patient blood	Intradialytic	Status	Periodic	Numeric	XXX	%	0..1	O	X

## 9.4 Alarms/Alerts

Table 3 – Dialysis Machine Alarms/Alerts

Source Identifier	Event Identifier <sup>1</sup>	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

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**Table 3 – Dialysis Machine Alarms/Alerts**

Source Identifier	Event Identifier <sup>1</sup>	Alert Type	Dialysis Common Name	Definition	Use
<b>MDC_DEV_HDIALY_FILTER_CHAN</b>					
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
<b>MDC_DEV_HDIALY_CONVECTIVE_CHAN</b>					
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
<b>MDC_DEV_HDIALY_SAFETY_SYSTEMS_CHAN</b>					
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
<b>MDC_DEV_HDIALY_THERAPY_OUTCOMES_CHAN</b>					
MDC_HDIALY_THERAPY_OUTCOMES_CHAN	MDC_EVT_HDIALY_THERAPY_PAT_TREATMENT_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_TREATMENT_TIME_ENDED	tech	Treatment Time Ended	Notification that target time of treatment has been met	O
<b>MDC_DEV_HDIALY_UF_CHAN</b>					
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

## Dialysis Machine Implementation Guide

**Table 3 – Dialysis Machine Alarms/Alerts**

Source Identifier	Event Identifier <sup>1</sup>	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
<b>MDC_DEV_PRESS_BLD_NONINV_VMD</b>					
<b>MDC_DEV_PRESS_BLD_NONINV_CHAN</b>					
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
<b>MDC_DEV_ANALY_SAT_O2_VMD</b>					
<b>MDC_DEV_ANALY_SAT_O2_CHAN</b>					
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
<b>MDC_DEV_BLOOD_CHEM_VMD</b>					
<b>MDC_DEV_BLOOD_CHEM_CHAN</b>					
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

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 required 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.