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**HL7 Socket Tech. Document**
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Revision History

1.1 General Edits

1.2 Added A08 trigger event and replaced "Visits Units" to "Qty" in SCH Process records generic mappings

1.3 Updated to include medication, immunization and service import functionality

1.4 Updated to include ADT demographic elements, insurance, poverty level, annual screening and service importing from DFT messages

1.5 Client mapping option and updates relevant for CAREWare 6

The purpose of this document is to explain how CAREWare processes information conveyed as HL7 and sent through the CAREWare Socket Interface. Like all CAREWare import features, the Socket Interface translates source values so that they are compatible with destination fields. The sources in this case are values from elements in the HL7 message, and these translations are called mappings in CAREWare.

The HL7 socket uses a combination of predefined HL7 fields to determine which fields to look at for certain things to match on as well, and it uses a new generic mapping architecture for these translations. The predefined fields are primarily used for provider mapping, client mapping, and import record mappings. This document focuses on the new generic mapping architecture. The HL7 Socket currently has been tested with HL7 version 2.3.

## HL7 Messages Types, Trigger Events, and Indexes

The HL7 socket interface processes seven different types of HL7 messages: ADT, BAR, ORU, VXU, VXR, RAS, DFT and SIU. Although each message type has multiple trigger events, CAREWare will only process those specified below. The HL7 element "Message Type" is found in the MSH segment at position 9. The trigger event is a subfield of this element, which is found at the first subfield 9.1.

The following ADT messages primarily include demographic, insurance, poverty level, and hospital admission data:
- A01 (admit notification)
- A03 (discharge)
- A04 (patient registration)
- A08 (update patient information)

- A11 (cancel)
- A34 (merge patient)
- A35 (merge patient)

The following SIU event types are processed in CAREWare to import appointment, service, and referral data:
- S12 (new appointment)
- S13 (rescheduling)
- S14 (modification)

While CAREWare could import diagnoses from the above ADT and SIU message types, it is recommended to import diagnoses through BAR messages for better processing and reporting. The following message types are allowed:
- P01 (add patient account)
- P02 (purge patient account)
- P03 (post detailed financial transactions)
- P04 (generate bills and receivable statements)
- P05 (update account)
- P06 (end account)

Labs, screenings, and screening labs are imported from the ORU message type:
- R01 (transcribed Reports)

Medications are imported from the RAS messages with event type:
- O01 (order message)

Vaccinations or Immunizations are imported from the following message type:
- V03 (response to query)
- V04 (unsolicited update to the vaccination record)

Services are also imported from the DFT financial transaction messages with event type:
- P03 (post detailed financial transaction)

CAREWare's Socket Interface breaks down the import process into distinct steps called Indexes, each defined by specific functionality and an option for activation by admin users.  All messages are initially processed by the *Make Stubs* index. This index parses the raw HL7 message and takes only the valid messages based on the message type and trigger event.  It creates message stubs, which are representations of the HL7 message that hold the status and fields necessary for processing.

The *Map Provider* Index creates and uses the provider mappings that associate the HL7 message with a provider in CAREWare. The value CAREWare typically uses to match the message to a provider is found in the Receiving Facility and Sending application element in the MSH segment.   If no value is present for the Receiving Facility element, the user

can set up an alternate value by specifying the segment and position in the field mapping section of the *HL7_Make_Document_Stubs* index. It takes the alternate value and stores it in the Receiving Facility element when processing begins. When CAREWare processes this index, it initially creates a mapping record if none exists for this Receiving Facility and Sending Application pair; the message and its stubs are marked for deletion since no activation code or provider specification has been set up for it. Once a provider mapping is set up and an activation code is entered for this Receiving Facility/Sending Application pair, CAREWare will update the import status to Map Client.

The *Map Client* index is used to match the HL7 message to a CAREWare patient. The interface uses the Patient ID (External ID) found in the PID segment to identify patients. The provider mapping specification done in the Map Provider part of the process allows the user to specify which CAREWare field to use for matching. If the message does not contain a value for the PID element, the user can specify an alternate value using the field mapping in the *HL7_Make_Document_Stubs* index.

In addition to matching the patient based on the value, CAREWare uses a secondary check called the demographic threshold, which considers additional criteria even when the ID matches as described above. This additional check compares last name, first name, and date of birth, and the threshold set in the provider mappings will determine how closely those demographic elements need to match in order for the record to be considered a match. When that threshold is not met, the message and all related stubs are marked for deletion. However, CAREWare also has a feature to automatically add new clients based on user configurable setting.

In cases where the patient information does not match an existing CAREWare client record, the interface can still import results into an observation provider, which stores data for Ryan White-suspected patients, depending on whether diagnosis and generic condition results meet certain criteria. For diagnosis conditions, the interface checks for whether or not the patient had a particular diagnosis. For generic conditions, the user can set the interface to compare any segment element to a user-defined value.

CAREWare also provides optional manual client matching functionality (screenshot below). Admin users can use this to review and match patient records within the provider that have been identified by the Map Provider process. Once enabled, Manual Client Matching is available across all providers importing data through the HL7 Socket Interface. An option to automatically add clients in case of a mismatch is available as well. It is recommended to use the "Auto-Add Clients" (screenshot below) with great caution because that could potentially increase the clients within the provider to unmanageable levels.

Administrative Options > Data Import and Export Features > HL7 Socket Interface > Interface Settings

Edit    Fallback Conditions    Couchbase Settings    Back

## Interface Settings

**Client Matching**

Manual Matching: ☐
Auto Add Clients: ☑

**Auto-Purge Settings**

Settings for unmatched client data only

Higher Interval (Days): 60
Higher Score: 30
Last Higher Activity: 9/25/2020 12:01:00 AM
Lower Interval (Days): 30
Lower Score: 3
Last Lower Activity: 10/20/2020 12:01:00 AM

Setting for purging the entire interface data

Interval (months): 12

The *Process Records* Index is used to import specific data into CAREWare. Each message type imports different data into CAREWare. There are checks to make sure that all required data elements needed for particular imports are mapped prior to allowing the import to proceed.  For example, before importing a diagnosis, CAREWare must know four required elements: the provider, the patient, the diagnosis, and the diagnosis date. The interface resolves the provider and client in the *Map Provider* and *Map Client* indexes. The two remaining elements are resolved by mappings in the *Process Records* index. Once all four are recognized, the import moves forward.

CAREWare also provides an option to match providers and clients in one step using client provider lookup indexes. When using lookup indexes, it is advised not to operate with other Map Provider/Map Client indexes activated to avoid inconsistent provider and client matching functionality. The lookup indexes search for patients across all CAREWare providers and set the provider and client values based on the setup. The following cases are possible:

- No client/provider combination is found: CAREWare automatically adds the client record to a provider according to conditions set on the Fallback Conditions screen (screenshot below).
- A single client/provider record is found: if the client threshold is met, the client is assigned to the provider; otherwise the fallback provider settings are used.
- Several clients in a provider are identified: CAREWare flags the importing client as "Duplicate" and waits for user resolution.
- A single client is found in several providers: values entered for the client custom field for import provider are used for the import; if these are not found, the Primary Provider calculation used in CAREWare's Custom Report module is used.

In special cases, CAREWare can import services, instead of labs, from ORU messages. This happens when the ORU segments contain custom built service codes in OBX 3.1. The relevant indexes created for the service import are PWX_Map_Provider, PWX_Map_Client and PWX_Process_Records.

## Generic Mappings

The generic mapping feature offers a way for users to specify any field in the HL7 message as a value they want to associate with a particular client field. CAREWare will use this information to link the values. While this enables the field mappings to be flexible, there are certain restrictions on the flexibility permitted within the processing.

## Default Mappings

The interface creates some default mappings when a user activates an index. The user can adjust and add to these field mappings as necessary. For example, a user can import appointment records from the HL7 and have them stored as services in the CAREWare client record, and the user can choose which value in the message (a particular doctor's name, a location, or an insurance type) should be used to map to the CAREWare subservice field. Once CAREWare imports the completed appointment, if no service exists for this appointment, CAREWare will create the service based on the mappings.

There are a few default mappings associated with each index (so that users don't have to start from scratch every time they activate this module). The default mappings also ensure that the fields required to import data into CAREWare are defined.  The tables below list the default mappings associated with each index.  Some indexes do not have default mappings.

## HL7_Make_Document_Stubs

| Field Mapping Label | Segment | Position | Usage |
| --- | --- | --- | --- |
| Provider_id | MSH | 5.0 | Match CAREWare provider |
| Alt_provider_id | MSH | 4.0 | Specifies the provider ID to use if the default value is blank |
| Match_ptn_id | PID | 2.0 | Match patients |

| Alt_match_ptn_id | PID | 4.0 | Specifies the alternate patient identifier to use if default is blank |
|---|---|---|---|

## Map Client Index

| Field Mapping Label | Segment | Position | Usage | Default Values |
|---|---|---|---|---|
| Map_cl_gnd_rfk | PID | 8.0 | Match gender | F = Female<br>M = Male<br>O = Other<br>U = Unknown |
| Race | PID | 10.0 | Match race | W = White<br>B = Black<br>A = Asian<br>I = Indian<br>O = Other<br>U = Unknown |
| Map_cl_stt_rfk | PID | 11.3 | Match state | |
| Dgn_dgn_df_fk | DG1 | 3.0 | Match diagnosis | Has all diagnoses listed in current diagnosis definitions table. Mapping uses ICD10 codes |
| Diagnosis_Type | DG1 | 6.0 | Used to filter for final types of diagnosis | A = Admitting<br>W = Working<br>F = Final |

## Process Records ADT

| Field Mapping Label | Segment | Position | Description | Default Values |
|---|---|---|---|---|
| Map_cl_gnd_rfk | PID | 8.0 | Match gender | F = Female<br>M = Male<br>O = Other<br>U = Unknown |
| Race/Subgroup | PID | 10.0 | Match race | W = White<br>B = Black<br>A = Asian<br>I = Indian<br>O = Other<br>U = Unknown |
| map_cl_hispanic_yes_un_rfk | PID | 22.0 | Ethnicity/Subgroup | |
| map_cl_phone | PID | 13.0 | Phone | |
| Map_cl_street | PID | 11.0 | Street | |
| Address2 | PID | 11.1 | Address continued | |
| Map_cl_city | PID | 11.2 | City | |
| Map_cl_stt_rfk | PID | 11.3 | Match state | |
| map_cl_brt_gn_rfk | PID | 8.0 | Birth Gender | |
| Mrn | MRG | 1.0 | Match previous patient ID | |

| Acct | MRG | 3.0 | Match previous account number | |
|---|---|---|---|---|
| Patient_Class | PV1 | 2.0 | Specifies the patient class field.  Used in conjunction with patient type to determine the admission type | E = Emergency<br>I = Inpatient<br>O = Outpatient<br>P = Preadmit<br>R = Recurring<br>B = Obstetrics<br>C = Commercial<br>N = N/A<br>U = Unknown |
| Patient_Type | PV1 | 18.0 | Specifies the patient type.  Used in conjunction with patient class to determine the admission type | E = Emergency<br>I = Inpatient<br>O = Outpatient<br>P = Preadmit<br>R = Recurring<br>B = Obstetrics<br>C = Commercial<br>N = N/A<br>U = Unknown |
| Admission_type | PV1 | 4.0 | Specifies hospital admission type.  Used to determine whether or not admission is an emergency visit | A = Accident<br>E = Emergency<br>L = Labor and Delivery<br>R = Routine<br>C = Elective<br>N = Newborn<br>U = Urgent |
| Dgn_comment | PV1 | 17.1 | Specifies doctors name to be added to comments | |
| Vtl_sg_pk | PID | 18.0 | Holds the patient account number. Used to identify a hospital admission | |
| Vtl_sg_date | PV1 | 44.0 | Holds the date of admission | |
| Vtl_sg_notes | PV2 | 3.1 | Holds the admission reason | |
| dischargeDate | PV1 | 45 | Holds the date of discharge | |
| Dgn_dgn_df_fk | DG1 | 3.0 | Match diagnosis | Will have all diagnosis listed mapped by ICD10 Codes in current diagnosis definitions table. |

| Diagnosis_Type | DG1 | 6.0 | Used to filter for final types of diagnosis | A = Admitting W = Working F = Final |
|---|---|---|---|---|
| Dgn_date | DG1 | 5.0 | Used as the diagnosis date | |

POV, INS and ANN_SCR indexes come into effect once an ADT message contains GT1, PV1 and IN1 segments respectively.

## Process Records POV

| Field Mapping Label | Segment | Position | Description | Default Values |
|---|---|---|---|---|
| pvr_lv_household_income | GT1 | 27.0 | Household income | |
| pvr_lv_household_size | GT1 | 28.0 | Household size | |
| pvr_lv_date | PV1 | 44.0 | Visit date used as poverty level date | |

## Process Records INS

| Field Mapping Label | Segment | Position | Description | Default Values |
|---|---|---|---|---|
| Insurance | IN1 | 4.0 | Match Insurance Codes | Has all diagnoses listed in CAREWare Insurance table |
| ins_as_date | PV1 | 44.0 | Visit date used as insurance assessment date | |

## Process Records ANN SCR

| Field Mapping Label | Segment | Position | Description | Default Values/Comments |
|---|---|---|---|---|
| tst_tst_df_fk | PV1 | 3.3 | Household income | Available under OBX segment 3.0. All tests available in CAREWare for mapping |
| tst_qlt_ts_fk | PV1 | 3.3 | Household size | Available under OBX segment 5.0. All relevant result mappings available in CAREWare |
| tst_date | PV1 | 44.0 | Visit date used annual screening date | |

## Process Records BAR

| Field Mapping Label | Segment | Position | Description | Default Values |
|---|---|---|---|---|
| Dgn_dgn_df_fk | DG1 | 3.0 | Match diagnosis | Has all diagnoses listed in current diagnosis definitions table.  Mapping uses ICD10 codes |
| Diagnosis_Type | DG1 | 6.0 | Used to filter for final types of diagnosis | A = Admitting W = Working F = Final |

| Dgn_date | DG1 | 5.0 | Used as the diagnosis date | |
|---|---|---|---|---|

## Process Records SCH

| Field Mapping Label | Segment | Position | Description | Default Values |
|---|---|---|---|---|
| Dgn_dgn_df_fk | DG1 | 3.0 | match diagnosis | Has all diagnoses listed in current diagnosis definitions table. Mapping uses ICD10 codes |
| Diagnosis_Type | DG1 | 6.0 | Used to filter for final types of diagnosis | A = Admitting<br>W = Working<br>F = Final |
| Dgn_date | DG1 | 5.0 | Used as the diagnosis date | |
| App_time_scheduled | AIG | 8.0 | Used to set the appointment time | |
| Map_sb_sbs_fk | AIG | 3.0 | Used to specify the type of subservice for appointment | All subservices for contract based on import provider |
| App_pk | SCH | 1.0 | Used to identify a specific appointment | |
| Visit_Units | SCH | 9.0 | Used to update service quantity | |
| Filler_Status_Code | SCH | 25.0 | Identifies the status of the appointment | Pending = Pending<br>Waitlist = Waitlist<br>Booked = Booked<br>Started = Started<br>Overbooked = Overbooked<br>DC = DC<br>Deleted = Deleted<br>Blocked = Blocked<br>Canceled = Canceled<br>Complete = Complete |

## Process Records MDC

| Field Mapping Label | Segment | Position | Description | Default Values |
|---|---|---|---|---|
| mdc_quantity | RXE | 1.0 | Used to for quantity | |
| mdc_frq_rfk | RXE | 1.1 | Used for medication frequency | |
| mdc_start_date | RXE | 1.3 | Used as the medication start date | |
| mdc_end_date | RXE | 1.4 | Used as medication end date | |
| mdc_avl_md_fk | RXE | 2.0 | Used to specify the type of available medication | All medication definitions based on import provider |
| mdc_units | RXE | 5.0 | Used to specify units | |

| | | | | |
|---|---|---|---|---|
| mdc_pd_md_frm_fk | RXE | 6.0 | Used to specify medication form | |
| mdc_instructions | RXE | 7.0 | Used to specify medication instructions | |
| mdc_strength | RXE | 25.0 | Used to specify strength for a medication | |
| mdc_ind_rfk | RXE | 27.0 | Specifies medication Indication | All indications available within the provider |
| mdc_prp_rfk | RXE | 27.1 | Specified medication prophylaxis | All prophylaxes available within the provider |

## Process Records IMM

| Field Mapping Label | Segment | Position | Description | Default Values |
|---|---|---|---|---|
| imm_date | RXA | 3.0 | Used to retrieve the immunization date | |
| Imm_imm_df_fk | RXA | 5.0 | Used the retrieve immunization definition | all immunization definitions available within the provider |

## Process Records PWX

| Field Mapping Label | Segment | Position | Description | Default Values |
|---|---|---|---|---|
| srv_date | PV1 | 44.0 | Used to retrieve the immunization date | |
| cnt_sb_pk | ORU | 3.0 | Used the subservice contract information | All subservices for contract based on import provider |

## Process Records DFT

| Field Mapping Label | Segment | Position | Description |
|---|---|---|---|
| Transaction ID | FT1 | 2.0 | Used to add, edit or delete services |
| srv_date | FT1 | 4.0 | Service Date |
| cnt_sb_pk | FT1 | 7.0 | Service Name |
| Transaction Description | FT1 | 8.0 | Service Description |
| srv_qty | FT1 | 10 | Service Quantity |
| srv_price | FT1 | 11 | Service Unit price |