Graphnet Feed Spec - Clinical Documents - Generic

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Update	0.03	19/11/2019	Qaez Anwar	Updated Supported File Types to include RTFs. Document has been migrated to new template/naming convention.
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1 Purpose

The purpose of this document is to describe how CareCentric can receive clinical documents from third party systems via the HL7 Medical Document Message (MDM) format or alternatively using the file drop process.

1.1 Document Scope and Limitations

Any internal implementation details, XML Schemas and specifications defined by Graphnet within this document are subject to change without further notice. The CareCentric Highway module is beyond the scope of this document and any reference to the actual internal components or workings of this product in any form (e.g. visual, written) are subject to change without notice.

1.2 General Information / Reference Documents

The Graphnet interface specification is guided by the requirements of the following specifications and standards:
ANSI/HL7 V2.4-2000 (This is a revision of ANSI/HL7 V2.3.1-1999)

This document requires that the reader has a good understanding of HL7 messages, rules and format. Further information can be acquired from the following website:
https://www.hl7.org.uk/standards/hl7-standards/hl7-version-2/

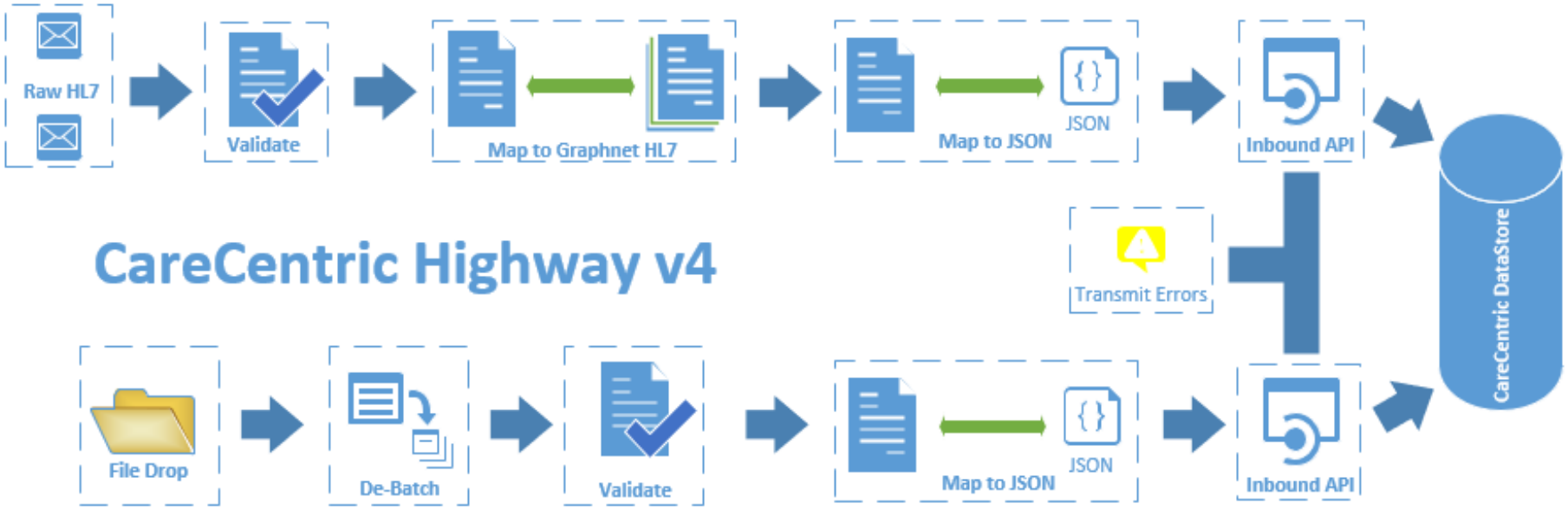
1.3 Definitions

Term / Abbreviation	Description
ACK	Acknowledgement
EHR	Electronic Health Record
HL7	Health Level Seven
MLLP	Minimum Lower Layer Protocol
NAK	Negative Acknowledgement

2 CareCentric Highway Integration Engine

CareCentric Highway v4 is a cloud-based service where processing takes place in the Microsoft Azure platform. The service can also be deployed locally on premise. Data is sent to Highway using secure protocols HTTPS/FTPS. Azure meets a set of international and industry-specific compliance standards such as ISO/IEC 27001/27002:2013, HIPAA and FedRAMP.
The following diagram illustrates the concept for receiving data in to CareCentric using the Highway Integration Engine to extract and integrate data from a wide range of health and social care IT solutions.

Note - This is not indicative of all physical environments and is provided as a conceptual guide only.



2.1 Transport / Network Security

Real Time HL7 messages are encrypted at socket level using TLS 1.2. Any messages other than HL7 will be encrypted when the files are sent to the Highway v4 server.
The configuration of the network including firewalls, IP addresses and re-routing of data are the responsibility of the sending party (Trust).

2.2 Error Handling

Highway v4 incorporates synchronous ACK/NACK Reponses when HL7 messages are received. If any issues occur during processing, they are logged (as per diagram above) and can be configured to be sent out as Email Notifications.

2.3 Supported File Types

File Type	File Drop	HL7 OBX:5.2	HL7 OBX:5.3
PDF	Yes	application	pdf
RTF	Yes	application	rtf
Word (doc)	Yes	application	msword
Word (docx)	Yes	application	vnd.openxmlformats-officedocument.wordprocessingml.document
Excel (xls)	Yes	application	vnd.ms-excel
Excel (xslx)	Yes	application	vnd.openxmlformats-officedocument.spreadsheetml.sheet
Image	Yes	image	jpeg or png

Note - Supported RTF, Word & Excel File Types are converted to PDF format prior to render in the UI.

2.4 Message Formats

2.4.1 HL7 Message Overview

The message structure that Graphnet expects to receive will be in the format of a HL7 message (version 2.4). The communication for HL7 messages and acknowledgments will be transmitted using TCP/IP protocols and the HL7 Minimum Lower Layer Protocol (MLLP) for streaming the data.
A HL7 message is composed of segments that are sub-divided into fields that contain data. Each HL7 message has a message type that indicates the type of information that is contained in the message body. Each field is separated by a pipe character '|', subfields are separated by a caret '^' and repeating fields by a "~".
Further information is available from the Health Level Seven UK site: http://www.hl7.org.uk/

2.4.2 HL7 MDM - Original document notification and content (event T02)

The expected inbound message format for notification of a clinical document / clinical document with accompanying content is a HL7 v2.4 MDM^T02 – Medical Document Message type. The message uses the following segments:

- MSH – Message Header
- EVN – Event Type
- PID – Patient Identification
- PV1 – Patient Visit
- TXA – Document Notification
- OBX – Observation / Result

2.4.3 HL7 MDM - Document Status Change Notification (event t03)

The expected inbound message format for document status change notification (cancel document) is a HL7 v2.4 MDM^T03 – Medical Document Message type. The message uses the following segments:

- MSH – Message Header
- EVN – Event Type
- PID – Patient Identification
- TXA – Document Notification

2.5 HL7 Fields Definition

2.5.1 MSH Segment

Sequence	Name	Notes	Required = R Optional = O Not Required - R
1	Field Separator		R
2	Encoding Characters		R
3	Sending Application	Uniquely identifies the sending application Surfaced in 'Title' field of tile - concatenated with other message fields in this format: TXA:2-PV1:10-MSH:3	R
4	Sending Facility		O
5	Receiving Application	Can be set to "CareCentric Highway"	O
6	Receiving Facility		O
7	Date/Time of Message	HL7 Timestamp format	R
8	Security		N
9	Message Type	To include message type code and trigger event	R
10	Message Control ID	Used for versioning on a message transaction level	R
11	Processing ID		N
12	Version ID	HL7 version information – not required as message will be expected to comply with HL7 v2.4	N
13	Sequence Number		N
14	Continuation Pointer		N
15	Accept Acknowledgement Type		N
16	Application Acknowledgment Type	Usually set to 'AL' – Which always sends an ACK	O
17	Country Code		N
18	Character Set		N
19	Principal Language of Message		N
20	Alternate Character Set Handling Scheme		N
21	Conformance Statement ID		N

2.5.2 EVN Segment

Sequence	Name	Notes	Required = R Optional = O Not Required - R
1	Event Type Code		N
2	Recorded Date Time	The date and time the transaction was entered.	O
3	Date Time Planned Event		N
4	Event Reason Code		N
6	Event Occurred	Date and time the event actually occurred	O
7	Event Facility		N

2.5.3 PID Segment

Sequence	Name	Notes	Required = R Optional = O Not Required - R
1	Set ID - PID		O
2	Patient ID		O
3	Patient Identifier List (Expect NHS Number and/or Other Main number)	PID 3.1 used for sending NHS Number and/or other main number – Field is repeatable.	R
3.5	Patient Identifier Type	NHS = NHS Number PI = Local Patient Identifier	R
4	Alternate Patient ID		N
5	Patient Name		R
5.1	Family Name		R
5.2	Given Name		O
5.3	Middle Name (or Initials)		O
5.4	Suffix (e.g. JR or III)		O
5.5	Prefix / Title e.g. Mr		O
5.7	Name Type Code	L = Legal Name A = Alias Name	O
6	Mother's Maiden Name		N
7	Date/Time of Birth		R
8	Administrative Sex	F = Female M = Male U = Unknown / Undefined	O
9	Patient Alias	Can also be provided in PID 5 with Name type code set to 'A' Alias	O
10	Race		N
11	Patient Address	May be required for any patient matching criteria	O
11.1	Street Address		O
11.2	Other Designation		O
11.3	City		O
11.5	Postal Code	May be required for any patient matching criteria	O
11.7	Address Type		O
11.8	Other Geographic Destination		O
12	County/Parish Code		O
13	Phone Number – Home		O

Sequence	Name	Notes	Required = R Optional = O Not Required - R
14	Phone Number – Business		O
15	Primary Language		O
16	Marital Status	S = Single M = Married D = Divorced A = Separated W = Widowed U = Unknown O = Other	O
17	Religion		O
18	Patient account number		N
19	SSN Number – Patient		N
20	Driver's License Number		N
21	Mother's Identifier		N
22	Ethnic Group		O

** Please note – PID sequence 23-38 not required.*

2.5.4 PV1 Segment

Support is provided in CareCentric for the PV1 segment in an MDM^T02 message type to meet the HL7 v2.4 standard. The segment is listed as mandatory according to the standard specifications, however the data is not used by CareCentric for clinical document information and this segment can be omitted, sent with no data or sent with data but will not be processed.

Sequence	Name	Notes	Required = R Optional = O Not Required - R
1	Set ID – PV1		O
2	Patient Class		O
3	Assigned Patient Location		O
4	Admission Type		O
5	Preadmit Number		O
6	Prior Patient Location		O
7	Attending Doctor		O
8	Referring Doctor		O
9	Consulting Doctor		O
10	Hospital Service	Surfaced in 'Title' field of tile - concatenated with other message fields in this format: TXA:2-PV1:10-MSH:3	O
11	Temporary Location		O
12	Preadmit Test Indicator		O
13	Re-admission Indicator		O
14	Admit Source		O
15	Ambulatory Status		O
16	VIP Indicator		N
17	Admitting Doctor		O
18	Patient Type		O
19	Visit Number		O
36	Discharge disposition		O
37	Discharged to Location		O
44	Admit Date/Time		O
45	Discharge Date/Time		O

** Please note – sequence 20-35, 38-43 and 46-52 are not required by CareCentric.*

2.5.5 TXA Segment

Sequence	Name	Notes	Required = R Optional = O Not Required - R
1	Set ID – TXA		O
2	Document Type	Surfaced in 'Title' field of tile - concatenated with other message fields in this format: TXA:2-PV1:10-MSH:3	R
2.1	Identifier	Must be an empty field	N
2.2	Text	'Document Type' used in CareCentric to display type of document e.g. 'Discharge Summary'	R
2.4	Alternate Identifier	A Snomed code *If documents are surfaced to patients in the PHR, they can be filtered by document type, for example maternity/ante-natal documents. To enable this functionality, a SNOMED code must be provided for each document to identify its type.*	O
2.5	Alternate Text	The Snomed Term for code used. Desirable where a Snomed code has been supplied	O
2.6	Name Of Alternate Coding System	Must be set to SCT where a snomed code is supplied in 2.4	O
3	Document Content Presentation	Usually set to TX or TEXT	O
4	Activity Date/Time		O
5	Primary Activity Provider Code/Name		O
6	Origination Date/Time	Date and Time the document was created. This is the date time that is used by CareCentric for the document.	R
7	Transcription Date/Time		O
8	Edit Date/Time		O
9	Originator Code/Name		O
10	Assigned Document Authenticator		O
11	Transcriptionist Code/Name		O
12	Unique Document Number	To be used for document versioning (alternative is to use TXA:16)	R

Sequence	Name	Notes	Required = R Optional = O Not Required - R
13	Parent Document Number		O
14	Placer Order Number		O
15	Filler Order Number		O
16	Unique Document File Name	To be used for document versioning only if TXA:12 does not have a unique ID	O
17	Document Completion Status		O
18	Document Confidentiality Status		O
19	Document Availability Status		O
20	Document Storage Status		O
21	Document Change Reason		O
22	Authentication Person, Time Stamp		O
23	Distributed Copies (Code and Name of Recipients)		O

2.5.6 OBX Segment

Sequence	Name	Notes	Required = R Optional = O Not Required - R
1	Set ID		O
2	Value Type	ED = Encapsulated Data ED used for binary encoded data (payload) RP = Reference Pointer RP used for pointing to a URL or Folder path for CareCentric Highway to retrieve the clinical document	R
3	Observation Identifier		O
4	Observation Sub-ID		O
5.2	MIME Type - Primary	e.g. a MIME type of 'application/pdf' where 'application' is the primary type	Required if OBX:5.5 is encoded
5.3	MIME Type – Sub Type	e.g. a MIME type of 'application/pdf' where PDF is the subtype	Required if OBX:5.5 is encoded
5.4	Encoding	e.g. Base64	Required if OBX:5.5 is encoded
5.5	Encoded Data or Reference Pointer (Filepath)	This field will contain the encoded payload or the file path name	R

** Please note – sequence 6-17 are not required.*

2.6 HL7 Message - Key Fields

2.6.1 Message Type [MSH-9]

Each HL7 message received will require a value in the *Message Type* field which is passed into the following parameter: [MSH-9].
This is used to help identify the type of message being received (see section 3.2).

2.6.2 UniqueID/Message Control ID [MSH-10/TXA-12]

Each HL7 message received should contain a value in the *Message Control ID* field which is passed into the following parameter: [MSH-10] or [TXA-12].
The value will be used as the unique ID for the message and any messages with the same value will be treated as a new version. This unique ID is used for messaging processes only (Transport layer verification). The Value will also be used for Cancelling a document previously sent in an MDM-T02 message.

2.6.3 Message Sending Facility [MSH 4]

Each HL7 message received should contain a value in the *Message Sending Facility* field which is passed into the following parameter: [MSH-4].
This value will be used to store the name of the source system in CareCentric. This value can also be used to display against the clinical document in CareCentric.

2.6.4 Message Date Time [TXA-6 / MSH-7]

Each HL7 message received should contain a value in the *Origination Date/Time* field which is passed into the following parameter: [TXA-6].
This value will be used to determine the date of the event which will be displayed in CareCentric against the patient's record. If this value is not available, CareCentric will use the value in the *Date/Time of Message* field which is passed into the following parameter: [MSH-7].

2.6.5 Patient Identifier List [PID-3/PID-3.5]

Each HL7 message received should contain a value in the *Patient Identifier List field* which is passed into the following parameter: [PID-3]. The detail in this segment is used for patient matching.
The value passed in here should be the patient's local number and, optionally, the NHS number. The number type should be indicated by the *Identifier Type Code* in PID 3.5.
Possible Number Types and Code to use:

Identifier Type	Number
NHS	NHS number
PI	Local System number or PAS Number or Hospital Number
MRN	Master Record Number
HOSP	Hospital Number

2.6.6 HL7 Message Content Validation

If data to be sent via HL7 contains any null references or empty strings, then the HL7 message should not contain any data in that sequence.
E.g. If deceased date has no value, then this should be sent across as an empty field. The following would be invalid:

- |NULL|
- | |
- |””|
- |”|

The HL7 message should escape any reserved characters. These typically are:

- ^
- ~
- \
- &
- |

If any data contains these characters, they will need to be escaped as described in the HL7 v2.4 specifications set out by the HL7 standards.

2.7 HL7 Message Data and Codes

CareCentric Highway usually displays the data extracted from the HL7 message ‘as-is’. Therefore, any locally used codes for descriptions need to be translated before being passed into the message and out to CareCentric.
CareCentric does have the ability if required to perform look-ups on codes when they are received in a HL7 message. This would be additional work to the standard data feed and will require a separate review of the exact requirements.

2.8 Sample HL7 Messages

2.8.1 Sample MDM^T02 Message - Encapsulated Data

MDM^T02 Message - Original document notification and content.
The content is base64 encoded and the message type contains encapsulated data ED.

```
MSH|^~\&|SendingApp|SendingFacil|RecApp|RecFacil|20140617155652||MDM^T02|1403017012483|P|2.4|
PID|||12345678^^^^PI~1111111111^^^^NHS||Smith^John^^^MR^^L||19500320|M|||3 PORTAL
ROAD^SOMEWHERE^COUNTY^^MK16 0AG^^HOME|||||S|C|||||A|
PV1||||||||||||||||||
TXA|1|^ED DischargeSummary^^1234567890^^SCT||20140617155631|C2411150^
HUSBAND^D|20140101083056|20140617155631||C2411150^HUSBAND^D||17130^User^Clinical|5896|Patient
Labels|||4fee6828146aa5497653ad1a13f240de8298b7b68a0.pdf|AU|
OBX|1|ED|1||^application^pdf^base64^JVBERi0xLjUNCiW1tbW1DQoxIDAgb2JqDQo8PC9UeXBlL0NhdGFsb2cvUGFnZXMgMiAwIFI
vTGFuZyhl..... ==|||||F|
```

2.8.2 Sample MDM^T03 Message - Cancel Document

MSH|^~\&|SendingApp|SendingFacil|RecApp|RecFacil|20140617155652||MDM^T03|1403017012483|P|2.4|
EVN|T03|||||
PID|||12345678^^^^PI~1111111111^^^^NHS||Smith^John^^^MR^^L||19500320|M|||3 PORTAL ROAD^SOMEWHERE^COUNTY^^MK16 0AG^^HOME|||||S|C|||||A|
TXA|1||||||||||5896|||||||1

3 Clinical Document Sent via File Drop

3.1 Message Format

The file drop solution will require the trust to provide the clinical document and an associated Meta data file which will be used for patient matching requirements and document data information.

3.2 File Naming Convention

The solution requires the file name of the Clinical document and the associated Meta data file to be identical. The Meta data file is read by the file listener process and the corresponding file is picked up based on the matching file name.
Alternatively, a filename reference in the Meta data file can be provided – this will need to be determined with the Graphnet development team.

3.3 Destination / Drop Folder Location

The file and associated Meta data file will be expected to be dropped into the same folder location which is made accessible to CareCentric Highway. This is typically sftp for cloud-based deployments.
The configuration and access to this folder to drop the files into securely is the responsibility of the trust and not the responsibility of Graphnet. Please contact a Graphnet programme manager if further information is required.

3.4 Sample File and Meta Data

The following ZIP file embedded contains a sample PDF document and Meta Data file.


Sample Meta File.zip

The Meta data file contains the following key elements:

- DocumentDate – The date of the document and will be used in CareCentric, yyyy-mm-ddTHH:MM:SS (Mandatory)
- OriginalFileName – The associated PDF file name e.g. “abc-123.pdf” (Mandatory)
- Title – The title of the document (Mandatory)
- DocType – What type of clinical data e.g. Correspondence (Optional)
- HospitalNumber – primary identifier for patient matching (Mandatory)
- NHSNumber – (Optional)
- Surname – (Optional)
- DOB – yyyy-mm-dd (Optional)
- UniqueId – The unique id of a document. Needed for version updates. (Mandatory)
- Specialty – This is displayed in CareCentric (Optional)
- Organisation – (Optional)
- SCT – SNOMED Code (Optional)

4 CareCentric Clinical Document Business Rules

When CareCentric Highway receives clinical documents via HL7 message or file drop from the Trust Interface Engine / other 3rd party system, the Highway processes the message by extracting/storing the data and creates a set of 'views' or 'documents' within CareCentric Gateway to display the information received. Clinical document data is stored as binary in the Graphnet database.

4.1 EPR Tree Folder / Hub View and Document Name

The clinical document files will appear against the patient record in CareCentric. The location of the files in the patient record tree will need to be confirmed for a clinical document feed for CareCentric. The documents will be filed in the tree in date order. The document date will be taken from the HL7 message location TXA:6 for filing in CareCentric.

The document name will be taken from TXA:2 Document Type and displayed in the tree. Similarly, in CareCentric Plus, this information will be used in the Hub Tile view for clinical correspondence data.

4.2 Version Control / CRUD (Create, Update, Delete)

If version control is required, a Unique ID will be required for each message. The following applies for each method:

4.2.1 HL7 Messages - Version Control

The unique ID should be contained with the TXA segment of the HL7 message. The Unique ID will be taken from the HL7 Location: TXA:12 – Unique Document. If the Unique ID of a message exists in the database, the message will be treated as an update to the existing message in the database.

Please note, TXA:16 can be used as an alternative to TXA:12 for document version control.

Clinical Document CRUD Rules	
Create	New records based on the *Unique ID* (TXA:12) will be detected and added. The identifier will be retained in the *UniqueID* column of the Graphnet document table.
Update	Existing records based on the key *Unique ID* will be detected and the inbound document will be made a newer version of the existing document.
Delete	Documents can be soft deleted/cancelled via an MDM^T03 message with Unique ID populated in TXA:12

4.2.2 File Drop - Version Control

The unique ID should be contained within the associated Meta Data file. The Unique ID will be taken from the meta data file (//metadata/document/UniqueId). If the Unique ID of a message exists in the database, the message will be treated as an update to the existing message in the database.

Clinical Document CRUD Rules	
Create	New records based on the key *Unique ID* (//metadata/document/UniqueId) will be detected and added. The identifier will be retained in the *UniqueID* column of the Graphnet document table.
Update	Existing records based on the key *Unique ID* will be detected and the inbound document will be made a newer version of the existing document.
Delete	None. Documents will never be deleted.

4.3 Patient Matching

Once a message has been received by CareCentric Highway, the processing framework will begin to process each message. During the processing phase, each message will be checked to see whether the patient data being received can be matched against a patient in CareCentric.
The patient matching algorithm used for the checking process will comprise of a key identifier such as the NHS number (verified) or a main system number which is found in the PID section of the HL7 message being received or in the Meta data file using the file drop solution. A secondary check can be made against the details supplied if deemed necessary.
Since each data feed can contain a variation of PID information, the patient matching will be determined during the development of the feed to meet the requirements of the sending system and CareCentric.
Any messages which cannot be matched at the first attempt will be retried for a configurable number of times and if it still fails, it will go through a second level retry process.
The second level retry process will use a sliding intervals approach. A minimum interval and a maximum interval are configured as well as the number of retries. For every retry, the interval is increased successively with each operation until it reaches the maximum interval or maximum number of retries. These values will be determined based on the individual requirements of the sending system to CareCentric.
Any messages which fail the second level retry process will be rejected and logged.

4.4 Patient Merges

When sending data for merged patient records, the update should contain the Patient ID for the record the change has been made against, whether that is the master or minor number. Any updates against the master or minor record will appear as part of the master record in CareCentric but will retain an association to the original record should there be any requirement to demerge in future.