



RIAYATI Program **Interface Control Document (HL7 MFN Inbound)**

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Table 1: Version History

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1 About this document

1.1 Purpose of this Document

The interfaces addressed in this document are designed to allow bi-directional communications using the health care industry's Health Level 7 (HL7) version 2.5.1 standards for the exchange of electronic health data between information systems. The interfaces are designed to:

- Process transcriptions communicated electronically from a sending system (such as an electronic medical record or practice management system) into the Riayati HIE receiving system.

This document describes the interface, addresses the data structure and available communication options, and provides other coordination information for implementing the interface. To assist the parties involved in planning, installing, and using the interface, applicable message segments are included.

We will commonly refer to the above as “providers”, i.e., those who are participating in Riayati HIE program.

This document covers the following:

- a) The protocols and handshake supported for exchange of messages.
- b) Message Segment descriptions of different event type supported by Riayati HIE.

References to the HL7 standard are made throughout this document. The web site for HL7 specifications can be found at <http://www.hl7.org/>.

1.2 Audience

This document is intended for the Technical Team from the Provider Organizations from the Northern Emirates and EMR vendors.

1.3 Abbreviations and Terms

Abbreviation	Term
API	Application Programming Interface
ESB	Enterprise Service Bus
FHIR	Fast Healthcare Interoperability Resources
HIE	Health Information Exchange
HTTP	Hyper Text Transport Protocol
MOHAP	Ministry of Health and Prevention
SOAP	Simple Object Access Protocol
UAE	United Arab Emirates

Table 3: Abbreviations and Terms

2 Introduction

2.1 RIAYATI Program

His Highness Sheikh Mohammed bin Rashid Al Maktoum announced in 2015 the initiative to establish a Health Information Exchange system – “RIAYATI” for patients in the Northern Emirates, UAE. In order to facilitate the movement of patients across healthcare providers, as well as connect public and private hospitals and clinics to share and exchange Health Records.

The RIAYATI Service will be the primary force driving an integrated, sustainable modern digital health platform that improves the safety of the patients, healthcare quality and population health in general through the safe sharing of medical data and information of all healthcare system beneficiaries across the Northern Emirates.

2.2 Health Information Exchange

RIAYATI Health Information Exchange will make quality healthcare data available for improvement of the patient care and support the futuristic innovative services like Clinical Decision Support, UAE specific clinical pathways, advanced analytics and Artificial Intelligence.

The RIAYATI HIE has various components as mentioned below to support the above-mentioned objectives.

- Enterprise Service Bus
- Registries
 - Patient Registry
 - Provider Registry
 - Organization Registry
 - Document Registry
 - Terminology Registry
- Repositories
 - Clinical Data
 - Documents

2.3 HL7 Concepts

2.3.1 HL7 Definitions

- i. **Message:** A message is the atomic unit of data transferred between systems. It is comprised of a group of segments in a defined sequence. Each message has a message type that defines its purpose and a trigger event. For example, the ADT is a message type and A01 is a trigger event. Between text messages in a batch, two carriage returns/line feeds (hex characters 0D0A0D0A) represent the end of each message. All the ADT messages will contain the snapshot of the AL1, DG1, PR1, IN1, NK1 segments for the visit,
- ii. **Segment:** A segment is a logical grouping of data fields. Segments within a defined message may be required or optional, may occur only once, or may be allowed to repeat. Each segment is named and is identified by a segment ID, a unique 3-character code. The hex characters '0D0A' that act as a Segment Terminator (equivalent to a Carriage Return and Line Feed) denote the end of each segment.
- iii. **Field:** A field is a string of characters. The segment it is in and the position within the segment identify each field; e.g., PID-5 is the fifth field of the PID segment. Optional data fields need not be valued. Whether a field is required, optional, or conditional in a segment is specified in the segment attribute tables.

A maximum length of the field is stated as normative information. Exceeding the listed length should be considered an error.

In segments attribute table Required/Mandatory data is designated as “**R**”, Optional field data is designated as “**O**” and Required if available is designated as “**RA**”.

- iv. **Component:** A component is one of a logical grouping of items that comprise the contents of a coded or composite field. Within a field having several components, not all components are required to be valued. Examples in this document demonstrate both fully valued and partially valued coded and composite fields.
Item number: Each field is assigned a unique item number. Fields that is used in more than one segment will retain their unique item number across segments.
- v. **Null and empty fields:** The null value is transmitted as two double quote marks (""). A null-valued field differs from an empty field. An empty field should not overwrite previously entered data in the field. The null value means that any previous value in this field should be overwritten.
- vi. **Data Type:** A data type restricts the contents and format of the data field. Data types are given a 2- or 3-letter code. Some data types are coded or composite types with several components. The applicable data type is listed and defined in each field definition. Refer <http://www.hl7.org/> for complete listing of data types used in this document and their definitions.
- vii. **Delimiters:** The delimiter values are given in MSH-1 and MSH-2 and used throughout the message. Applications must use agreed upon delimiters to parse the message.

Following are the recommended delimiters for messages:

Delimiter	Suggested Value	Usage
Segment Terminator	<CR> ((hex 0D0A)	Terminates a segment record. This value cannot be changed by implementers.
Field Separator		Separates two adjacent data fields within a segment. It also separates the segment ID from the first data field in each segment.
Component Separator	^	Separates adjacent components of data fields where allowed.
Subcomponent Separator	&	Separates adjacent subcomponents of data fields where allowed. If there are no subcomponents, this character may be omitted.
Repetition Separator	~	Separates multiple occurrences of a field where allowed.
Escape Character	\	Escape character for use with any field represented by an ST, TX or FT data type, or for use with the data (fourth) component of the ED data type. If no escape characters are used in a message, this character may be omitted.

		However, it must be present if subcomponents are used in the message.
--	--	---

- viii. **Message Syntax:** Each abstract message is defined in special notation that lists the 3-letter segment identifiers in the order they will appear in the message. The general rule is as follows: No brackets around it - Required - **[]** - Optional - **{ }** - Repeating - **{ [] }** - Optional Repeating.
- ix. **Trigger Events:** The HL7 Standard is written from the assumption that an event in the real world of healthcare creates the need for data to flow among systems. The real-world event is called the trigger event. For example, the trigger event, an observation (e.g., a CBC result) for a patient is available, may cause the need for that observation to be sent to several other systems. When the transfer of information is initiated by the application system that deals with the triggering event, the transaction is termed an unsolicited update.
- x. **Z segments:** Are not supported.

2.3.2 HL7 Standards – Exceptions

Some exceptions to the HL7 conventions are noted herein. Data is added, updated and removed at the segment level. Messages should contain ALL current data. It is recommended that all segments for demographic interfaces contain fully populated fields appropriate for the message type. It is also recommended that all messages contain all segments. This should be observed even if the data has not changed.

Message segment maps indicate fields not directly used by the Riayati HIE as shaded entries. Unused fields are shown up to the last segment field that is processed by the Riayati HIE.

2.3.3 Robust Port Connectivity

If the sending system communicates to the Riayati HIE via a TCP/IP port number, it must be able to dynamically determine the status of the port to which it sends. In the event the client interface server has been rebooted or restarted for any reason, the sending system must be able to detect that the port was offline and reopen the port without user support.

2.3.4 Communications Options

Riayati HIE can configure an interface to function using TCP/ IP over Secure site-to-site Virtual Private Network (VPN) or File transfer using SFTP.

VPN (Virtual Private Network)

A Secure site-to-site Virtual Private Network (VPN) between Riayati HIE Servers and participants (Sending Systems) shall be implemented.

TCP/IP

TCP/IP is the preferred communications protocol for exchanging HL7 messages. The following is a list of the major guidelines for the establishment of TCP/IP communications:

1. A Site to site Secure VPN Tunnel will need to be established between the Participant and the Riayati HIE host system vendor prior to establishing the TCP/IP port and socket connection.
2. Unique TCP/IP port addresses and socket numbers must be determined by the client, Riayati HIE, and the host system vendor prior to installation. Suggested ports are:
3. The sending system will act as a TCP/IP client and is responsible for opening the port prior to sending data. The receiving system will act as a TCP/IP server.

IMPORTANT NOTE: The sending system must be able to monitor the status of the port and must be able to reconnect to the port without user support if it has been disconnected.

4. The HL7 minimal lower layer protocol recommendations are observed.
5. The leading character for each transmission can be configured for each interface and is represented here as <VT> (ASCII 11).
6. Up to three ending characters for each transmission can be configured for each interface. They are represented here as <FS> (ASCII 28) and <CR> (ASCII 13).
7. Each segment is followed by a <CR> (ASCII 13).
8. The exchange of messages will be as follows:

At the execution of the trigger event in the host system, the host sends a message to Riayati HIE:

Host System		Riayati HIE
<VT> MSH segment<CR> followed by first segment<CR> followed by next segment<CR> ... last segment<CR> <FS><CR> <CR>	➔	Received by the product TCP/IP Receiver and placed in a directory on the file system. Predetermined identifiers in the message are validated by the Receiver script, if valid. The product takes the message and file to a SQL Message Queue, parser process it into the Data Store.

After receipt of each message, the product sends an ACK Message to Host on the same port number:

Host System		Riayati HIE
Received by Host	➔	<VT> MSH segment<CR> MSA segment<CR> ERR segment<CR> <FS><CR> <CR>

If the MSA indicates that the message was received, then the host is free to send the next message. This is repeated until all messages are sent. If the MSA indicates that the message contained an error, the host must resend the message until either the MSA indicates the message was received, or the interface times out.

The simple general acknowledgment (ACK) should be sent by the receiving system to respond to the receipt of the messages.

The product TCP/IP Receiver script processes the MSH segment and the Message Control ID (MSH-10) is used to construct the outbound HL7 ACK. The ACK message only indicates that the message was received. Errors in processing usually result in HIE Event log messages. If the MSH segment is not found or cannot be processed, a HL7 NAK is sent. In the case of a low-level error, a TCP/IP NAK is returned.

MSA Example with MSH Message Header:

```
MSH|^~\&|SENDING_APP|SENDING_APP|RECEIVING_APP|RECEIVING_APP|
dfx20030917141003||MFK^M02|89899775||2.5
MSA|AE|20190801222928586
ERR||ERR^1^1|ValErrors^Field
```


3 Basic Message Construction Rules

3.1 Encoding Rules for Sending

- a) Encode each segment in the order specified in the abstract message format.
- b) Place the Segment ID first in the segment.
- c) Precede each data field with the field separator.
- d) Encode the data fields in the order and data type specified in the segment definition table.
- e) End each segment with the segment terminator.
- f) Component separators need not be represented for components, subcomponents, or repetitions that come at the end of a field. The data fields below, for example, are equivalent:

`^XXX&YYY&&^` is equal to `^XXX&YYY^`

`|ABC^DEF^^|` is equal to `|ABC^DEF|`

3.2 Encoding Rules for Receiving

The following rules apply to receiving HL7 messages and converting their contents to data values:

- a) Ignore segments, fields, components, subcomponents, and extra repetitions of a field that are present but were not expected.
- b) Treat segments that were expected but are not present as consisting entirely of fields that are not present.
- c) Treat fields and components that are expected but were not included in a segment as not present.

4 HL7 MFN (Master File Notification)

HL7 MFN messages carry provider information for HL7 communications but also provide important information about trigger events (such as provider update, provider creation.). The most important segments in the MFN message are the STF (STAFF) segment. Riayati HIE requires only Physician information updates for this message.

Real time events triggering MFN messages:

Type	Description	Trigger To be fired when?
M02	Master files notification - Master file - staff practitioner	If any update/creation in Provider database

HL7 MFN messages uses the segments listed below:

Segments / Trigger event	M02
MSH	R
MRI	R
MRE	R
STF	R
PRA	O

Definitions

Term	Definition
R	Required
C	Conditional
O	Optional
RA	Required if available

IMPORTANT NOTE: All coded fields use standard HL7 field codes unless otherwise specified. Any deviations from the standard HL7 field code tables must be reported to the Riayati HIE.

All messages must be sent in Snapshot mode - Riayati HIE expects all data to present in all the messages.

Message Acknowledgement

Riayati HIE will respond with Acknowledgement (MFK^M02) Message for each MFK Message with the MSA Segment along with ERR segment in case of any validation error in the HL7 message.

MSA Segment

Seg/Field	Req	HL7 Name	Data Type	Max Len	Comments
MSA-1	R	Acknowledgment Code	ID	2	HL7 Table 0008
MSA-2	R	Message Control ID	ST	20	

ERR Segment

Seg/Field	Req	HL7 Name	Data Type	Max Len	Comments
ERR-1	Backwards Compatible	Error Code and Location	ELD	493	Specifies the segment that contains an error and describes the nature of the error.
ERR-2	O	Error Location	ERL	18	This data type identifies the segment and its constituent where an error has occurred.
ERR-3	R	HL7 Error Code	CWE	705	Specifies a coded element and its associated detail.

4.1 MSH - Message Header

The following fields may be required from Attribute Table:

Seg/Field	Req	HL7 Name	Data Type	Max Len	Comments
MSH-1	R	Field Separator	ST	1	This field contains the HL7 field separator " " and is located between the segment ID "MSH" and the MSH 2 field. This dictates that " " will act as the field separator for the rest of the HL7 message. ' ' (ASCII 124)
MSH-2	R	Encoding Characters	ST	4	'^~\&' where '^' is the component delimiter (ASCII 94) '~' is the repeat delimiter (ASCII 126) '\' is the escape delimiter (ASCII 92) '&' is the subcomponent delimiter (ASCII 38)
MSH-3	O	Sending Application Namespace ID	HD	227	This field identifies the Sending Application as defined in the internal. This Application code will be assigned by Riayati. Table No: To be discussed during onboarding.
MSH-4	R	Sending Facility Namespace ID	HD	227	Facility License Number.
MSH-5	O	Receiving Application Namespace ID	HD	227	
MSH-6	O	Receiving Facility Namespace ID	HD	227	
MSH-7	R	Date/Time of Message	TS	26	Format: YYYYMMDDTTTT
MSH-8	O	Security	ST	40	
MSH-9	R	Message Type	MSG	15	
MSH-9.1	R	Message Code	ID	3	MFN
MSH-9.2	R	Trigger Event	ID	3	M02
MSH-9.3	R	Message Structure	ID	7	Message Structure
MSH-10	R	Message Control ID	ST	20	Unique message number Note: If a message is received with the same Message Control ID as the immediately previous message, it will be treated as an error.

MSH-11	O	Processing ID	PT	3	P (Production) or T (Testing) or D (Development)
MSH-12	R	Version ID	VID	60	HL7 version 2.5.1
MSH-13	O	Sequence Number	NM	15	
MSH-14	O	Continuation Pointer	ST	180	
MSH-15	O	Accept Acknowledgment Type	ID	2	
MSH-16	O	Application Acknowledgment Type	ID	2	
MSH-17	O	Country Code	ID	3	
MSH-18	O	Character Set	ID	16	
MSH-19	O	Principal Language of Message	CE	250	
MSH-20	O	Alternate Character Set Handling Scheme	ID	20	
MSH-21	O	Message Profile Identifier	EI	427	

Sample MSH segment:

```
MSH|^~\&|SENDING_APP|SENDING_FACILITY|RECEIVING_APP|RECEIVING_FACILITY|202008181126|SECURITY|MFN
^M02^MFN_M02|MSG00001|P|2.5|||AL|NE|THA|UNICODE UTF-8|||
```

4.2 MFI – Master File Identification

The following fields may be required from Attribute Table:

Seg/Field	Req	HL7 Name	Data Type	Max Len	Comments
MFI-5	R	Recorded Date/Time	TS	26	Format: YYYYMMDD[HHMM]

Sample MFI segment:

MFI|||||20171207162752

4.3 MFE – Master File Entry

The following fields may be required from Attribute Table:

Seg/Field	Req	HL7 Name	Data Type	Max Len	Comments
MFE-1	R	Record-Level Event Code	ID	3	MAD – Add, MDL – Delete, MUP – Update, MDC – Deactivate and MAC – Reactivate.
MFE-4	R	Primary Key Value	XCN	250	
MFE-4.1	R	ID Number.	ST	15	EMR system Primary key value for Provider master.

Sample MFE segment:

MFE|||||1767821233

4.4 STF - Staff

The following fields may be required from Attribute Table:

Seg/Field	Req	HL7 Name	Data Type	Max Len	Comments
STF-1	R	Primary Key Value	CX	250	
STF-1.1	R	Identifier	ST	20	Must be valid MOHAP License Number for the Physician.
STF-2	R	Staff Identifier List	CX	250	
STF-2.1	R	ID Number	ST	20	Must be Emirates ID for the Physician.
STF-3	R	Staff Name	XPN	250	
STF-3.1	R	Family Name	IS	194	
STF-3.2	R	Given Name	CX	30	
STF-3.3	O	Second and Further Given Names or Initials Thereof	ST	30	
STF-3.4	O	Suffix	ST	20	
STF-3.5	O	Prefix	ID	20	
STF-10	R	Phone	XTN	250	
STF-10.1	R	Telephone Number	ST	199	Format: 009715XXXXXXXXX
STF-15	R	E-Mail Address	ST	40	Must be Primary email which Physician has to access.

Sample STF segment:

STF|1475110|1475110|SAM^CARLS|||||500-000-0000^^|Test@gmail.com