Patient Monitoring Service (PMS)

Part 1: Appendix B: APIs

1 Interfaces

1.1 healthAPI

Description : This interface provides a reduced set of simplified operations that are sufficient in the context of the patient monitoring service that is being developed. It is derived from the HL7 FHIR standard for healthcare interoperability, based on the HAPI FHIR implementation of the FHIR specification in Java. The relevant OpenAPIs are described at: `https://hapi.fhir.org/baseR4/swagger-ui/`, while the FHIR standard is available at: `https://hl7.org/fhir/`. The descriptions from the data types used in this interface follow directly from the API documentation (`https://hapifhir.io/hapi-fhir/apidocs/hapi-fhir-structures-r5/org/hl7/fhir/r5/model/package-summary.html`).

Operations:

- void deleteObservation(string id) throws *AuthorizationException*, *AuthenticationException*
  - Effect: Delete an **Observation** instance with the specified id.
  - Sequence Diagrams: None
- void deletePatient(string id) throws *AuthorizationException*, *AuthenticationException*
  - Effect: Delete a **Patient** instance with the specfied id.
  - Sequence Diagrams: None
- void deleteRiskAssessment(string id) throws *AuthorizationException*, *AuthenticationException*
  - Effect: Delete a **RiskAssessment** instance with the specified id.
  - Sequence Diagrams: None
- **Observation** getObservation(string id) throws *AuthorizationException*, *AuthenticationException*
  - Effect: Retrieve an observation instance
  - Returns: The **Observation** with the specified identifier.
  - Sequence Diagrams: None
- **Patient** getPatient(string id) throws *AuthorizationException*, *AuthenticationException*
  - Effect: Retrieve a patient record with the specified identifier.
  - Returns: The **Patient** with the specified identifier.
  - Sequence Diagrams: None
- **RiskAssessment** getRiskAssessment(string id) throws *AuthorizationException*
  - Effect: Retrieve a **RiskAssessment** instance with the specified id.
  - Returns: The **RiskAssessment** with the specified identifier.

  - Sequence Diagrams: None
- **Observation** saveObservation(**Observation** observation) throws *AuthorizationException*, *AuthenticationException*
  - Effect: Create a new **Observation** instance or in case an existing **Observation** instance exists with the same identifier, update this **Observation** instance.
  - Returns: The **Observation** object.
  - Sequence Diagrams: None
- **Patient** savePatient(**Patient** patient) throws *AuthorizationException*
  - Effect: Create a new **Patient** instance or update an existing **Patient** instance.
  - Returns: The updated **Patient** object.
  - Sequence Diagrams: None
- **RiskAssessment** saveRiskAssessment(**RiskAssessment** riskAssessment) throws *AuthorizationException*, *AuthenticationException*
  - Effect: Create a new **RiskAssessment** instance or update an existing **RiskAssessment** instance.
  - Returns: The updated **RiskAssessment** object.
  - Sequence Diagrams: None
- List<**Observation**> searchObservation(**Query**<**Date**> date, **Query**<String> dataAbsentReason, **Query**<**Patient**> subject, **Query**<String> valueConcept, **Query**<**Date**> valueDate, **Query**<**Observation**> derivedFrom, **Query**<**Patient**> patient, **Query**<**Quantity**> valueQuantity, **Query**<String> identifier, **Query**<String> performer, **Query**<String> method, **Query**<String> category, **Query**<String> device, **Query**<**ObservationStatus**> status) throws *AuthorizationException*
  - Effect: Search for **Observation** instances matching the specified query criteria.
  - Returns: The list of **Observation**s matching the specified search criteria.
  - Sequence Diagrams: None
- List<**Patient**> searchPatient(**Query**<**Date**> birthDate, **Query**<Boolean> deceased, **Query**<String> addressState, **Query**<String> administrativeGender, **Query**<String> link, **Query**<String> language, **Query**<String> addressCountry, **Query**<**Date**> deathDate, **Query**<String> phonetic, **Query**<String> telecom, **Query**<String> addressCity, **Query**<String> email, **Query**<String> given, **Query**<String> identifier, **Query**<String> address, **Query**<String> generalPractitioner, **Query**<Boolean> active, **Query**<String> addressPostalCode, **Query**<String> phone, **Query**<String> organizationCustodian, **Query**<String> name, **Query**<String> family) throws *AuthorizationException*, *AuthenticationException*
  - Effect: Search for **Patient** instances matching the specified query criteria.
  - Returns: The list of **Patient**s matching the specified search criteria.
  - Sequence Diagrams: None
- List<**RiskAssessment**> searchRiskAssessment(**Query**<**Date**> date, **Query**<String> identifier, **Query**<String> performer, **Query**<String> method, **Query**<**Range**> probability, **Query**<**Patient**> subject, **Query**<String> condition, **Query**<**Patient**> patient, **Query**<**BigDecimal**> risk) throws *AuthenticationException*, *AuthorizationException*
  - Effect: Search for a **RiskAssessment** instance matching the provided query criteria.
  - Returns: The list of **RiskAssessment**s matching the specified search

criteria.
  - Sequence Diagrams: None

Diagrams: None

2 Exceptions

- *AuthenticationException* (△*SecurityException*):
  Missing or invalid credentials.
- *AuthorizationException* (△*SecurityException*):
  The requestor is not authorized to perform the requested action.
- *SecurityException*:
  Subtypes: △*AuthenticationException*, △*AuthorizationException*
  Parent class for security exceptions.

3 Data types

- **Address**:
  Attributes: **AddressUse** use, **AddressType** type, String text, List<String> line, String city, String district, String state, String postalCode, String country, **Period** period, long serialVersionUID
  Base StructureDefinition for Address Type: An address expressed using postal conventions (as opposed to GPS or other location definition formats). This data type may be used to convey addresses for use in delivering mail as well as for visiting locations which might not be valid for mail delivery. There are a variety of postal address formats defined around the world. The line attribute contains contains the house number, apartment number, street name, street direction, P.O. The text attribute specifies the entire address as it should be displayed e.g. on a postal label. This may be provided instead of or as well as the specific parts.
- **AddressType**:
  Enum: POSTAL, PHYSICAL, BOTH, NULL.
  Distinguishes between physical addresses (those you can visit) and mailing addresses (e.g. PO Boxes and care-of addresses). Most addresses are both.
- **AddressUse**:
  Enum: HOME, WORK, TEMP, OLD, BILLING, NULL.
  The purpose of the address.
- **Annotation**:
  Attributes: **Date** time, String text, long serialVersionUID, String author
  Base StructureDefinition for Annotation Type: A text note which also contains information about who made the statement and when.
- **BigDecimal**:
  Immutable, arbitrary-precision signed decimal numbers. A BigDecimal consists of an arbitrary precision integer unscaled value and a 32-bit integer scale
- **CodeableConcept**:
  Attributes: List<**Coding**> coding, String text, long serialVersionUID
  Base StructureDefinition for CodeableConcept Type: A concept that may

be defined by a formal reference to a terminology or ontology or may be provided by text.

- **CodeType**:
  Attributes: long serialVersionUID, String system, String value
  Primitive type "code" in FHIR, when not bound to an enumerated list of codes
- **Coding**:
  Attributes: String system, String version, **CodeType** code, String display, boolean userSelected, long serialVersionUID
  Base StructureDefinition for Coding Type: A reference to a code defined by a terminology system.
- **ContactComponent**:
  Attributes: List<**CodeableConcept**> relationship, String name, List<**ContactPoint**> telecom, **Address** address, String administrativeGender, String organization, **Period** period, long serialVersionUID
  A contact party (e.g. guardian, partner, friend) for the patient. The relationship attribute species the nature of the relationship between the patient and the contact person. It is a CodeableConcept (which can be formal reference to terminology or an ontology). For example, in the system `http://hl7.org/fhir/ValueSet/relatedperson-relationshiptype`, it can be coded as CHILD for a child, or MGRMTH for maternal grandmother, etc.
- **ContactPoint**:
  Attributes: **ContactPointSystem** system, String value, **ContactPointUse** use, int rank, long serialVersionUID, **Period** period
  Base StructureDefinition for ContactPoint Type: Details for all kinds of technology mediated contact points for a person or organization, including telephone, email, etc. The value attribute contains the actual contact point details, in a form that is meaningful to the designated communication system (i.e. phone number or email address). Rank specifies a preferred order in which to use a set of contacts. ContactPoints with lower rank values are more preferred than those with higher rank values. Period specifies the tiime period when the contact point was/is in use.
- **ContactPointSystem**:
  Enum: PHONE, FAX, EMAIL, PAGER, URL, SMS, OTHER, NULL.

- **ContactPointUse**:
  Enum: HOME, WORK, TEMP, OLD, MOBILE, NULL.

- **Date**:
  The class Date represents a specific instant in time, with millisecond precision.
- **Identifier**:
  Attributes: **IdentifierUse** use, String type, String system, String value, **Period** period, String assigner, long serialVersionUID
  Base StructureDefinition for Identifier Type: An identifier - identifies some entity uniquely and unambiguously. Typically this is used for business identifiers. The type is a a coded type for the identifier that can be used to determine which identifier to use for a specific purpose. The system attribute establishes the namespace for the value - that is, a URL that

describes a set values that are unique. The value attribute specifies the portion of the identifier typically relevant to the user and which is unique within the context of the system. The period specifies the time period during which identifier is/was valid for use. The assigner specifies the organization that issued/manages the identifier.

- **IdentifierUse**:
  Enum: USUAL, OFFICIAL, TEMP, SECONDARY, OLD, NULL.

- **Observation**:
  Attributes: List<**Identifier**> identifier, List<**Identifier**> partOf, **ObservationStatus** status, List<**CodeableConcept**> category, **CodeableConcept** code, **Patient** subject, **Period** effective, **Date** issued, List<**Identifier**> performer, String value, **CodeableConcept** dataAbsentReason, **CodeableConcept** interpretation, List<**Annotation**> note, **CodeableConcept** bodySite, **CodeableConcept** method, String device, List<**Observation**> hasMember, List<**Observation**> derivedFrom, long serialVersionUID, **ObservationReferenceRangeComponent** referenceRange, **ObservationComponentComponent** component
  Measurements and simple assertions made about a patient, device or other subject. The partOf attribute specifies the larger event of which this particular Observation is a component or step. For example, an observation as part of a procedure.
  The category specifies a code that classifies the general type of observation being made. For example, in the system `http://terminology.hl7.org/CodeSystem/observation-category`, vital-signs is used for clinical observations such as boold pressure, heart rate, etc.
  The code attribute describes what was observed. Sometimes this is called the observation 'name'. For example, in the system `http://loinc.org`, code '8867-4' is used for expressing the heart rate, '85354-9' for a blood pressure panel (which must have components '8480-6' and '8462-4' for, respectively, systolic and diastolic pressure.
  The performer is who was responsible for asserting the observed value as 'true'. This can refer to a Patient, Practitioner, organization, etc. The value is the information determined as a result of making the observation, if the information has a simple value.
  The dataAbsentReason provides a reason why the expected value in the element Observation.value[x] is missing. For example, in the system `http://terminology.hl7.org/CodeSystem/data-absent-reason`, 'not-applicable'.
  The interpretation is a categorical assessment of an observation value. For example, high, low, normal. For example, in the system `http://terminology.hl7.org/CodeSystem/v3-ObservationInterpretation`, 'H' for high, or 'ND' for not detected.
  The bodySite indicates the site on the subject's body where the observation was made (i.e. the target site). For example, in the system `http://snomed.info/sct`, code '344001' indicates the ankle.
  The method indicates the mechanism used to perform the observation. For example, in the system `http://snomed.info/sct`, code '46973005' indicates blood pressure taking procedure.
  The device attribute specifies an identifier of the device used to generate the observation data.

- **ObservationComponentComponent**:
  Attributes: String code, **Range** value, String dataAbsentReason, List<String> interpretation, long serialVersionUID, **ObservationReferenceRangeComponent** referenceRange
  Some observations have multiple component observations. These component observations are expressed as separate code value pairs that share the same attributes. Examples include systolic and diastolic component observations for blood pressure measurement and multiple component observations for genetics observations. The code describes what was observed. Sometimes this is called the observation 'code'. For example, in the system `http://loinc.org`, '8480-6' is used for the systolic component of the blood pressure.,
  The dataAbsentReason provides a reason why the expected value in the element Observation.component.value[x] is missing. For example, in the system `http://terminology.hl7.org/CodeSystem/data-absent-reason`, 'not-applicable'.
  The interpretation provides a categorical assessment of an observation value. For example, high, low, normal. For example, in the system `http://terminology.hl7.org/CodeSystem/v3-ObservationInterpretation`, 'H' for high, or 'ND' for not detected.
- **ObservationReferenceRangeComponent**:
  Attributes: **Quantity** low, **Quantity** high, **CodeableConcept** type, List<**CodeableConcept**> appliesTo, **Range** age, String text, long serialVersionUID
  Guidance on how to interpret the value by comparison to a normal or recommended range. Multiple reference ranges are interpreted as an "OR". In other words, to represent two distinct target populations, two 'referenceRange' elements would be used.
  The appliesTo specifies codes to indicate the target population this reference range applies to. For example, in the system `http://snomed.info/sct`, code '248152002' indicates female.
  The type specifies codes to indicate the what part of the targeted reference population it applies to. For example, in the system `http://terminology.hl7.org/CodeSystem/referencerange-meaning`, 'normal' for the 95% normal range, or 'recommended' for the recommended range by a relevant professional body.
  The text attribute contains a text based reference range in an observation which may be used when a quantitative range is not appropriate for an observation.
- **ObservationStatus**:
  Enum: REGISTERED, PRELIMINARY, FINAL, AMENDED, CORRECTED, CANCELLED, ENTEREDINERROR, UNKNOWN, NULL.
  The status of the observation result value or the RiskAssessment.
- **Patient**:
  Attributes: List<**Identifier**> identifier, boolean active, List<String> name, String administrativeGender, **Date** birthDate, **Date** deceased, List<**Address**> address, boolean multipleBirth, List<**Identifier**> generalPractitioner, **Identifier** managingOrganization, long serialVersionUID, **ContactComponent** contact
  Demographics and other administrative information about an individual or animal receiving care or other health-related services.

- **Period**:
  Attributes: **Date** start, **Date** end, long serialVersionUID
  Base StructureDefinition for Period Type: A time period defined by a start and end date and optionally time.
- **Quantity**:
  Attributes: **BigDecimal** value, String unit, String system, **CodeType** code, long serialVersionUID
  Base StructureDefinition for Quantity Type: A measured amount (or an amount that can potentially be measured). Note that measured amounts include amounts that are not precisely quantified, including amounts involving arbitrary units and floating currencies. Unit specifies a human-readable form of the unit. System contains the identification of the system that provides the coded form of the unit. The code contains a computer processable form of the unit in some unit representation system. For example, blood pressure can be expressed in the system `http://unitsofmeasure.org` and the unit mm[Hg].
- **Query<T>**:
  Attributes: List<T> values, List<String> qualifier
  The Query object is used to express search restrictions in a string-based format for interacting with the REST-based health API. For example, before a specified date is encoded as 'ltyyyy-MM-dd'. The list of qualifiers specify how the corresponding value should be used (e.g., lt for less than a date, matches if it should be present in a string, exact for an exact string match).
- **Range**:
  Attributes: long serialVersionUID, **Quantity** low, **Quantity** high
  Base StructureDefinition for Range Type: A set of ordered Quantities defined by a low and high limit.
- **RiskAssessment**:
  Attributes: List<**Identifier**> identifier, **ObservationStatus** status, **CodeableConcept** method, **CodeableConcept** code, **Patient** subject, **Date** occurrence, String condition, **Identifier** performer, List<**CodeableConcept**> reason, List<**Observation**> basis, String mitigation, List<**Annotation**> note, long serialVersionUID, **RiskAssessmentPredictionComponent** prediction
  An assessment of the likely outcome(s) for a patient or other subject as well as the likelihood of each outcome. Method specifies the algorithm, process or mechanism used to evaluate the risk. Code specifies the type of the risk assessment performed. For example, in the system `http://snomed.info/sct`, '709510001' represents Assessment of risk for disease (procedure). For assessments or prognosis specific to a particular condition, the condition attribute indicates the condition being assessed. It should be a reference to an existing condition but is a simplified as a string here. Reason specifies the reason the risk assessment was performed. Mitigation contains a description of the steps that might be taken to reduce the identified risk(s).
- **RiskAssessmentPredictionComponent**:
  Attributes: String outcome, **Range** probability, String qualitativeRisk, **BigDecimal** relativeRisk, **Date** when, String rationale, long serialVersionUID

Describes the expected outcome for the subject. Outcome speciifes one of the potential outcomes for the patient (e.g. remission, death, a particular condition). QualitativeRisk indicates how likely the outcome is (in the specified timeframe), expressed as a qualitative value (e.g. low, medium, or high). Rationale contains additional information explaining the basis for the prediction. Both outcome and qualitativeRisk are CodeableConcepts (which can be formal reference to terminology or an ontology), but simplified as a string.