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Healthcare Learning Object Metadata Specifications and Description Document

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Version No.	Date	Changed By	Changes Made
1.0	10 May 2008		
1.1	30 Sep 2009	Valerie Smothers	Corrected namespace prefix of keyword attributes in Appendix 3. Corrected healthcaremetadata,xsd file to reflect multiplicity of nonAccreditedProvider element.

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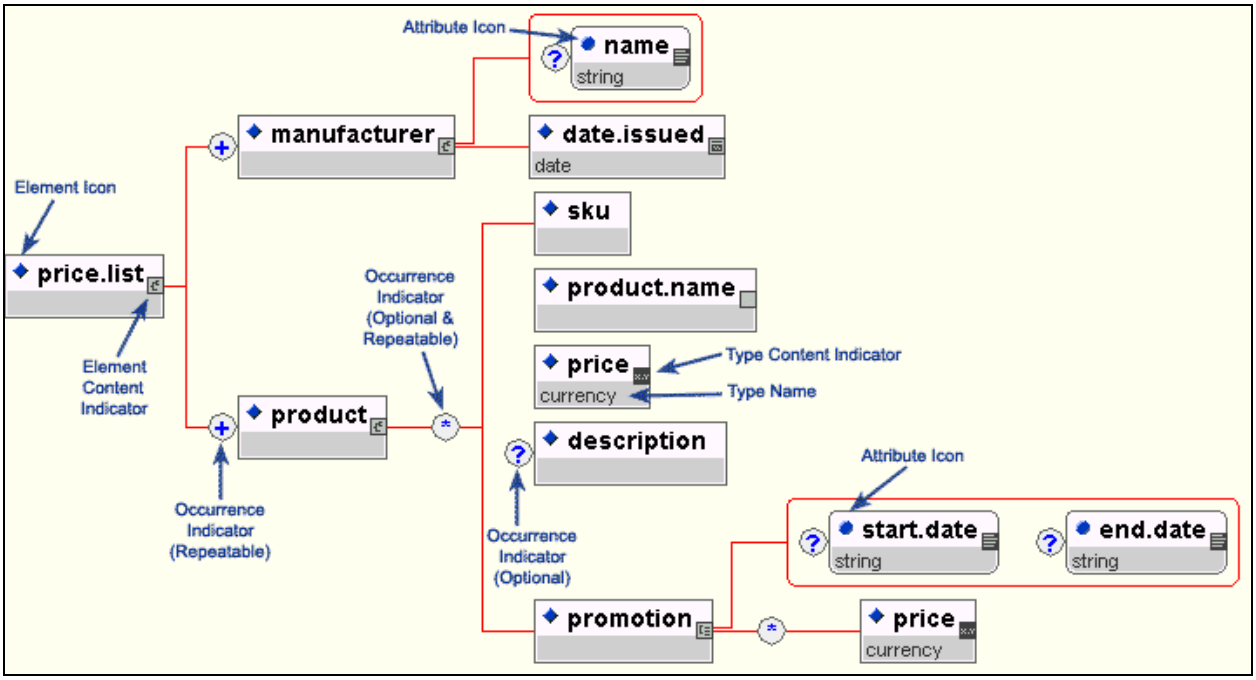
Documentation Conventions

This document uses the following conventions.

Documentation Conventions

Convention	Description
monospaced type	Sample XML tags, code, schema, or portion thereof
BoldText	When used with an XML tag name, indicates that the element contains subelements
Italicized Text	When used in an XML tag description, an attribute of the XML tag.
Tag description	Shading indicated that the tag is further described in a later part of the document

The following graphical standards are used for the XML diagrams in this document.



Graphical Standards from TIBCO's Turbo XML, Copyright TIBCO Software Inc.

Introduction

This document describes Healthcare Learning Object Metadata (Healthcare LOM) in detail. It is intended for use by anyone who wants to develop tools or implement electronic systems for managing and describing healthcare education and educational assets, such as images. The status of the document is indicated at the bottom of the page; draft documents are subject to review and approval through the MedBiquitous standards development process (see http://www.medbiq.org/about_us/consortium_process/processdocument.pdf).

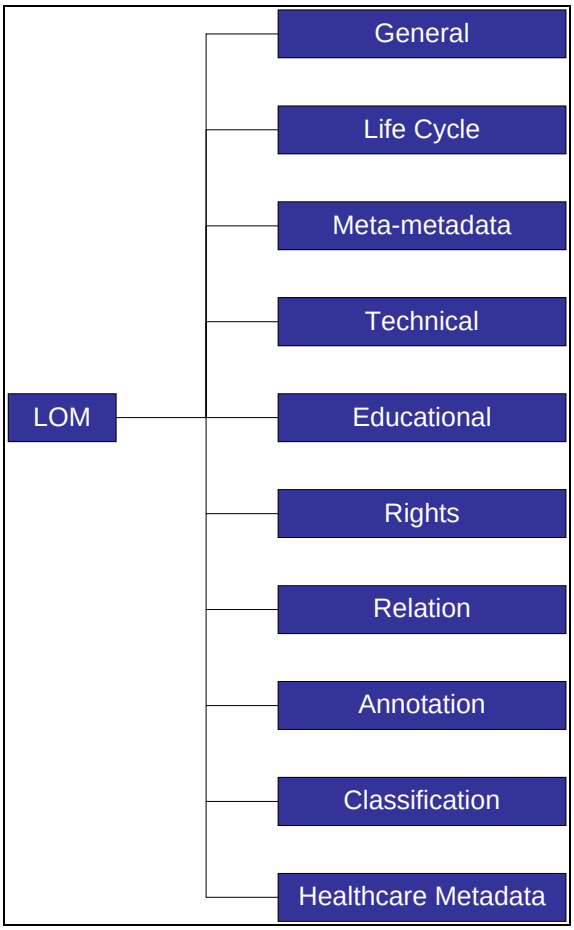
Healthcare LOM is based on and is a profile of the Institute of Electrical and Electronics Engineers (IEEE) 1484.12.1–2002 Standard for Learning Object Metadata (LOM) and the Extensible Markup Language (XML) Schema Definition Language Binding for Learning Object Metadata (IEEE 1484.12.3-2005) developed by the IEEE Learning Technology Standards Committee.

LOM is one of the standards used by the SCORM reference model for interoperability of online learning content. LOM provides descriptive information about a learning object. Just as a label on a container provides information on what's inside, learning object metadata provides information on a learning module, including the title, author, description, keywords, educational objective, and other relevant information. This information helps learners and content developers to find just the right piece of instruction. Learners can use the learning object as a mini-course, and content developers can include the learning object in a new course.

LOM does not address some of the special requirements for healthcare education, including disclosure of financial interests, implementation of medical taxonomies, and indication of continuing education credits. Healthcare LOM addresses these special requirements and others. Healthcare LOM extends the LOM standard and provides custom vocabularies for some metadata elements.

Learning Object Metadata (LOM)

Some familiarity with the LOM standard is essential to understand Healthcare LOM customizations. The figure below shows the nine categories LOM uses to organize its metadata elements plus the category used for healthcare extensions to LOM.



Healthcare LOM Categories

The elements within these categories provide general ways of describing aspects of a learning object. Some healthcare requirements for describing learning objects may be addressed by using elements within LOM, but several others are not. The requirements that are not addressed by existing LOM elements have been addressed by creating extensions to the LOM standard in the HealthcareMetadata category and by using custom vocabularies.

Metadata Requirements for Healthcare

The following table outlines healthcare requirements for learning object metadata and corresponding elements in Healthcare LOM. Any elements within healthcareMetadata are MedBiquitous extensions to the LOM standard.

Healthcare Requirements	Healthcare LOM Elements
Date released	lifecycle:contribute:date (use when describing the publishing organization's contributions)
Date reviewed	lifecycle:contribute:date (use when describing the individual reviewer's contributions)
Date of expiry	healthcareMetadata:healthcareEducation:expirationDate
Subject (from Medical Taxonomy)	general:keyword (Those wishing to include medical taxonomy references may do so using the MedBiquitous keyword attribute extensions)
Category	general:keyword
Intended audience (physician, patient, etc)	educational:context (using MedBiquitous defined vocabulary) and healthcareMetadata:healthcareEducation:targetAudience
Learner reading level	healthcareMetadata:healthcareEducation:targetAudience:readingLevel
Credits (accrediting body, credit types, units, provider, pacing, activity certification, accredited and non-accredited providers, and number of credits)	healthcareMetadata:healthcareEducation:credits
Date credit is released	healthcareMetadata:healthcareEducation:credits:releaseDate
Date credit expires	healthcareMetadata:healthcareEducation:credits:expirationDate
Activity location	healthcareMetadata:healthcareEducation:activityLocation
Start date and time	healthcareMetadata:healthcareEducation:startDateTime
End date and time	healthcareMetadata:healthcareEducation:endDateTime
Activity sponsorship	healthcareMetadata:healthcareEducation:activitySponsorship
Activity format	healthcareMetadata:healthcareEducation:activityFormat
Participation modality	healthcareMetadata:healthcareEducation:participationModality
Activity delivery	healthcareMetadata:healthcareEducation:activityDelivery

Healthcare Requirements	Healthcare LOM Elements
Curriculum classification	classification:taxonpath:source (using MedBiquitous defined vocabulary for classification purpose)
Educational Objectives	classification
Competencies, ACGME and others	classification
Learning outcomes	Classification (using MedBiquitous defined vocabulary for classification purpose)
Acknowledgement of commercial support	healthcareMetadata:healthcareEducation:CommercialSupport (yes/no) and healthcareMetadata:healthcareEducation:CommercialSupportAcknowledgement
Disclosure of relevant financial relationships	healthcareMetadata:healthcareEducation: relevantFinancialRelationship (yes/no) and healthcareMetadata:healthcareEducation: relevantfinancialRelationshipDisclosure
Disclosure of off label content	healthcareMetadata:healthcareEducation:offLabelUse (yes/no) and healthcareMetadata:healthcareEducation:offLableDescription
Mapping to guidelines	classification (using MedBiquitous defined vocabulary for purpose)
Mapping to formularies and drug lists	classification (using MedBiquitous defined vocabulary for purpose)
Level of Evidence	classification (using MedBiquitous defined vocabulary for purpose)

Healthcare Requirements	Healthcare LOM Elements
Resource Types	educational:learningResourceType
Animation	(using MedBiquitous defined vocabulary)
Audio	
Case Study	
Collaborative Forum	
Game	
Image	
Reference	
Tutorial	
Video	
Virtual Patient	
Image descriptors	healthcareMetadata:healthcareAsset
Annotated	
Clinical history	
Magnification	
Orientation	
Medical image	
Specimen type	
File height	
File width	

Healthcare LOM

This section describes the customizations made to the LOM standard, including the files provided in Healthcare LOM, extensions, custom vocabularies, and additional requirements of the Healthcare LOM standard.

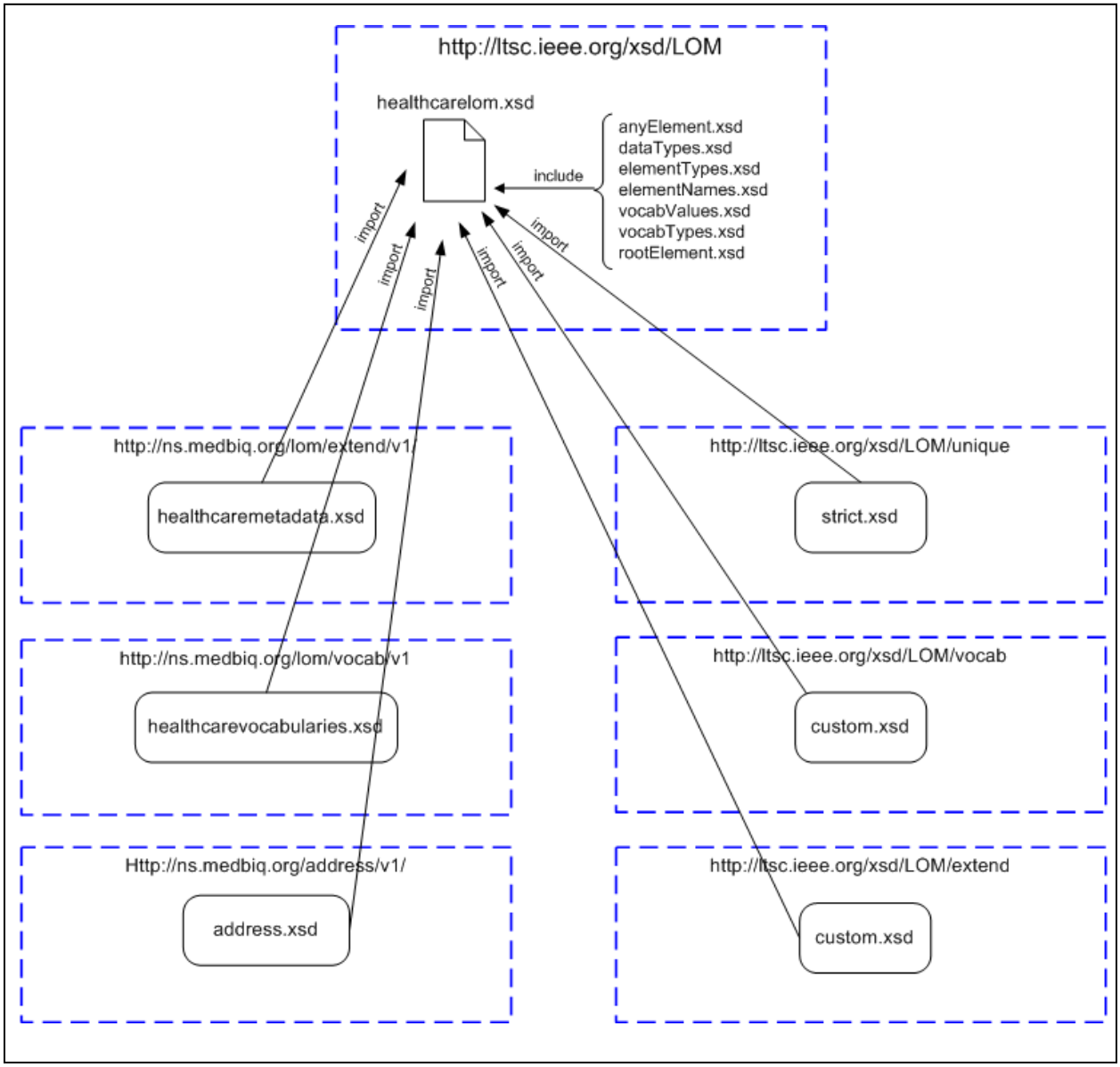
Schema Definition Files

The Healthcare LOM specification is defined technically by XML Schema Definition files, also called XSDs. Many of the XSDs used in Healthcare LOM are from the IEEE XML binding for the LOM standard, one of the component standards of SCORM. To facilitate implementation of LOM and adherence to pre-existing descriptions of the LOM schema, the LOM standard separates definitions of datatypes, elements, and vocabularies into different XSDs. Healthcare LOM incorporates additional XSDs to customize LOM for healthcare. The healthcarelom.xsd file imports the other XSDs that describe the lom datatypes, elements, vocabularies, and healthcare extensions.

The XSD files for Healthcare LOM are a part of this standard. The files are not included in the printed version of this standard but are available on the Internet at:
http://ns.medbiq.org/lom/extend/v1/

XML namespaces serve as labels that distinguish elements contained in the XSDs. Healthcare extensions to LOM use a MedBiquitous namespace.

The following diagram shows how healthcarelom.xsd unifies LOM files and healthcare extensions.



Healthcare LOM XML Schemas and Namespaces

Healthcare LOM files are described in the following table.

Healthcare LOM Files

File name	Description	Namespace	Dependencies
healthcarelom.xsd	The unifying schema file that provides a consistent structure for information describing healthcare and medical education.	http://ltsc.ieee.org/xsd/LOM	Imports: unique/strict.xsd vocab/custom.xsd extend/custom.xsd healthcare/ healthcaremetadata.xsd healthcare/ healthcarevocabularies.xsd Includes: common/anyElement.xsd common/dataTypes.xsd common/elementNames.xsd common/elementTypes.xsd common/rootElement common/vocabValues.xsd common/vocabTypes.xsd
unique/strict.xsd	Supports validating the uniqueness of LOM elements within their container elements.	http://ltsc.ieee.org/xsd/LOM/unique	—
vocab/custom.xsd	Joins custom vocabulary values with LOM vocabulary values to enable use of custom vocabularies.	http://ltsc.ieee.org/xsd/LOM/vocab	Imports: healthcarelom.xsd healthcare/ healthcarevocabularies.xsd

File name	Description	Namespace	Dependencies
extend/custom.xsd	Enables addition of custom elements to LOM.	http://ltsc.ieee.org/xsd/LOM/extend	Imports: healthcarelom.xsd
healthcaremetadata.xsd	Provides a consistent structure for descriptive information unique to healthcare and medical education.	http://ns.medbiq.org/lom/extend/v1/	Imports: healthcarelom.xsd
healthcarevocabularies.xsd	Provides a set of custom vocabularies specific to healthcare education.	http://ns.medbiq.org/lom/vocab/v1/	—
anyElement.xsd	Enables addition of custom elements to LOM.	http://ltsc.ieee.org/xsd/LOM	—
dataTypes.xsd	Defines datatypes used in defining several LOM elements.	http://ltsc.ieee.org/xsd/LOM	Imports: unique/strict.xsd extend/custom.xsd
elementTypes.xsd	Defines the content model and datatype of Healthcare LOM elements.	http://ltsc.ieee.org/xsd/LOM	Imports: extend/custom.xsd unique/strict.xsd healthcare/healthcaremetadata.xsd
elementNames.xsd	Declares each of the LOM elements except for lom.	http://ltsc.ieee.org/xsd/LOM	—
rootElement.xsd	Declares the lom element, which is the root element.	http://ltsc.ieee.org/xsd/LOM	—

File name	Description	Namespace	Dependencies
vocabTypes.xsd	Defines datatypes for those LOM elements whose values are taken from a defined vocabulary.	http://ltsc.ieee.org/xsd/LOM/	Imports: extend/custom.xsd vocab/custom.xsd unique/strict.xsd
vocabValues	Defines vocabularies for those LOM elements that require a defined vocabulary.	http://ltsc.ieee.org/xsd/LOM	—
address.xsd	Defines address fields for activity locations. This schema is part of the MedBiquitous Professional Profile.	http://ns.medbiq.org/address/v1/	

Healthcare LOM schema files are available for download from: http://ns.medbiq.org/lom/extend/v1/

Metadata Extensions

The following sections explain the grammar for the healthcaremetadata schema, which holds extensions to the LOM metadata schema. Values in bold under XML Tags column indicate that the element has subelements.

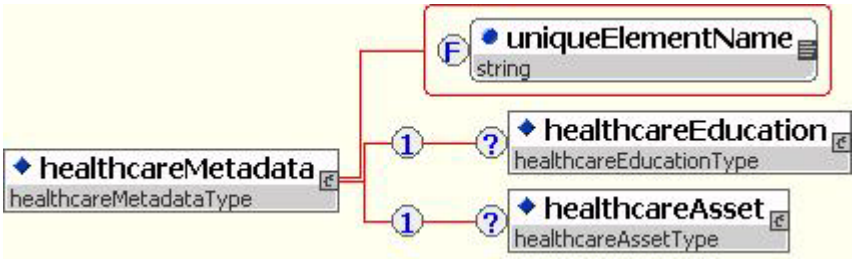
Datatypes not otherwise defined in the document, such as date, refer to datatypes defined within the XML 1.0 technical specification. For information on these datatypes, see the W3C Extensible Markup Language (XML) 1.0 (Fourth Edition).

All the elements having subelements will be defined in separate sections. All elements without subelements will be defined within the appropriate element sections that use them.

1 healthcareMetadata

healthcareMetadata is the root element. It contains metadata specific to healthcare education. healthcareMetadata must occur once if Healthcare LOM is being used.

healthcareMetadata has the subelements healthcareEducation, which describes healthcare metadata for educational offerings, and healthcareAsset, which describes healthcare specific metadata for images, multimedia files, and other types of assets. The uniqueElementName attribute ensures that only one instance of healthcareMetadata occurs in a Healthcare LOM document.

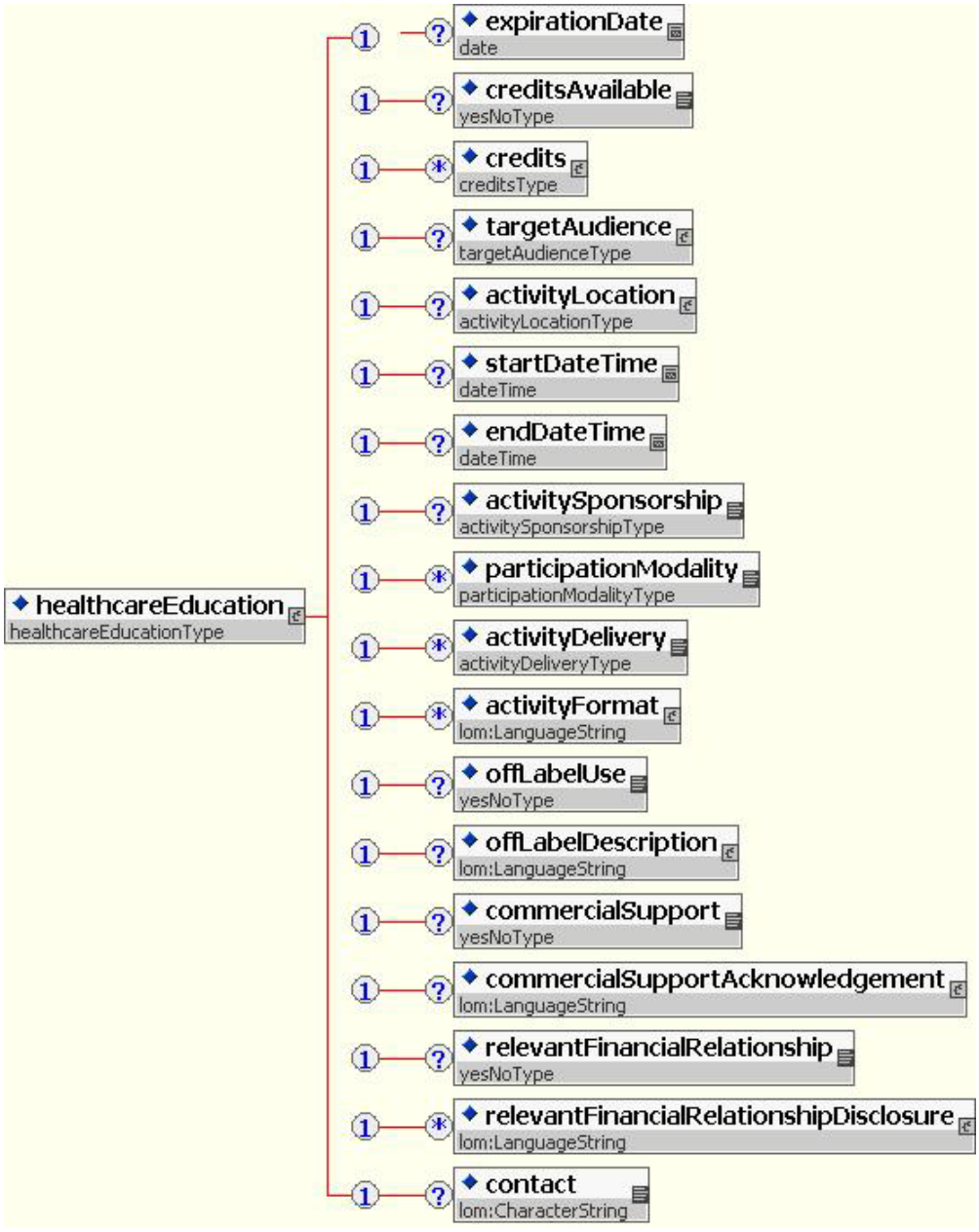


Example:

```
<healthcareMetadata>
   <healthcareEducation>
      ...
   </healthcareEducation>
   <healthcareAsset>
      ...
   </healthcareAsset>
</healthcareMetadata>
```

2 healthcareEducation

healthcareEducation is the subelement of healthcareMetadata that contains healthcare specific metadata for educational offerings. healthcareEducation is optional within a healthcareMetadata record.



healthcareEducation has several subelements.

HealthcareEducation Information

Element	Description	Required	Multiplicity	Datatype
healthcareEducation	healthcareEducation is the subelement of healthcareMetadata and defines healthcare specific metadata for educational offerings.	Optional	0 or 1	Container
expirationDate	expirationDate indicates the date after which this educational offering is no longer considered valid.	Optional	0 or 1	Date
creditsAvailable	creditsAvailable indicates whether or not credits are offered for the educational offering. Valid values are yes and no.	Optional	0 or 1	Restricted
credits	credits defines the credits that may be awarded for this educational offering. For more information, see section credits.	Optional	0 or more	Container
targetAudience	targetAudience contains subelements that describe the target audience for this educational offering. For more information, see section targetAudience.	Optional	0 or 1	Container
activityLocation	activityLocation indicates the geographical location in which an in person activity takes place. For more information, see section activityLocation.	Optional	0 or 1	Container
startDateTime	startDateTime indicates the date and time that a live activity begins.	Optional	0 or 1	Date time
endDateTime	endDateTime indicates the date and time that a live activity ends.	Optional	0 or 1	Date time

Element	Description	Required	Multiplicity	Datatype
activitySponsorship	activitySponsorship indicates the accredited provider's role in planning and presenting the activity. Valid values are direct and joint. Direct indicates that the accredited provider planned and presented the activity directly. Joint indicates that the accredited provider planned and presented the activity together with a non-accredited provider.	Optional	0 or 1	Restricted
participationModality	participationModality defines the learner's mode of participation, dictated by the activity medium. Valid values are conference/workshop, technology based, on the job, print.	Optional	0 or more	Restricted
activityDelivery	activityDelivery indicates the temporal nature of the activity. Valid values are live and not live.	Optional	0 or more	Restricted
activityFormat	activityFormat describes the type of learning activity described.	Optional	0 or more	Language String (see section Language String datatype for more inform-ation)
commercialSupport	commercialSupport indicates the existence of any commercial support, from a manufacturer of a commercial product. Valid values are yes and no.	Optional	0 or 1	Restricted
commercialSupportAcknowledgement	commercialSupportAcknowledgement describes the commercial support provided from a manufacturer of a commercial product.	Optional	0 or 1	Language String (see section Language String datatype for more inform-ation)

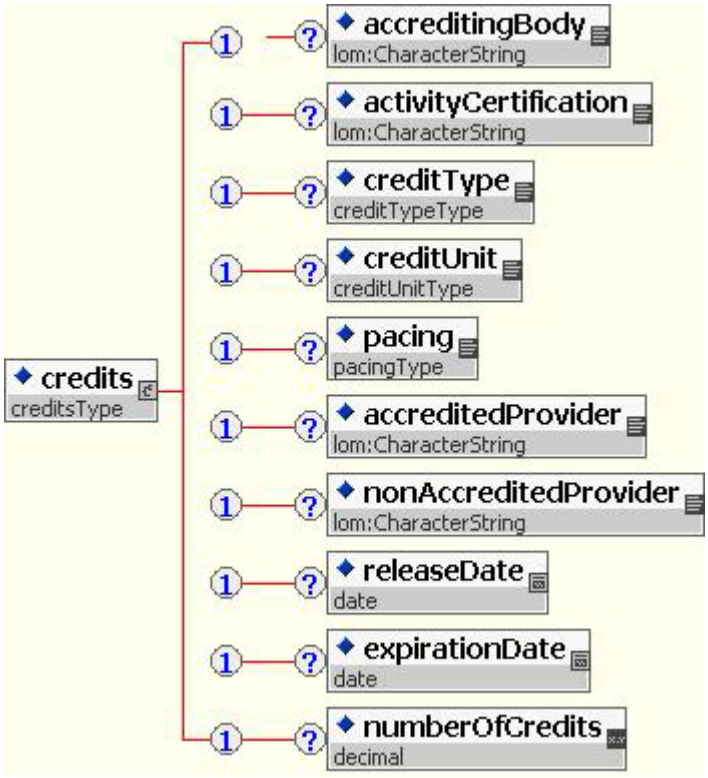
Element	Description	Required	Multiplicity	Datatype
offLabelUse	offLabelUse indicates whether or not this educational offering references off label usage of a drug. Valid values are yes and no.	Optional	0 or 1	Restricted
offLabelDescription	offLabelDescription describes any off label drug use referenced in this educational offering.	Optional	0 or 1	Language String (see section Language String datatype for more inform-ation)
relevantFinancialRelationship	relevantFinancialRelationship indicates the existence of any relevant financial interest or other relationship of a faculty member or other person in a position to influence the activity content with the manufacturer of any commercial product referenced in this activity. Valid values are yes and no.	Optional	0 or 1	Restricted
relevantFinancialRelationshipDisclosure	relevantFinancialRelationshipDisclosure describes any relevant financial interest or other relationship of a faculty member or other person in a position to influence the activity content with the manufacturer of any commercial product referenced in this activity.	Optional	0 or more	Language String (see section Language String datatype for more inform-ation)
contact	Contact identifies the person or organization that serves as the main point of contact for questions about the learning content.	Optional	0 or 1	Character String (see section Character String datatype for more inform-ation)

Example:

```
      <healthcareEducation>
         <expirationDate>2005-08-01</expirationDate>
         <hx:creditsAvailable>yes</hx:creditsAvailable>
         <credits>
          ...
         </credits>
         <targetAudience>
            <profession>
               <string language = "en">health educator</string>
            </profession>
         </targetAudience>
         <hx:activitySponsorship>direct</hx:activitySponsorship>
         <hx:participationModality>
           technology based
         </hx:participationModality>
         <hx:activityDelivery>not live</hx:activityDelivery>
         <hx:activityFormat>
            <string language="en">course</string>
         </hx:activityFormat>
         <commercialSupport>yes</commercialSupport>
         <commercialSupportAcknowledgement>
            <string language = "en">MedBiquitous gratefully acknowledges a
grant from the XYZ Foundation to provide funding for this course.</string>
         </commercialSupportAcknowledgement>
         <relevantFinancialRelationship>
           no
         </relevantFinancialRelationship>
         <contact>Edgar Allan Poe, eapoe@medbiq.org</contact>
      </healthcareEducation>
```

3 credits

credits is the subelement of healthcareEducation that describes the continuing education credits that may be awarded for this educational offering. Note that if an activity is certified to provide more than one type of continuing education credit (i.e. CME and CNE), the credits element should be repeated for each type of credit that may be awarded.



For a glossary of acronyms used to describe credit, see Appendix 1.

Credits Information

Element	Description	Required	Multiplicity	Datatype
credits	credits is the subelement of healthcareEducation that describes continuing education credits that may be awarded for this activity.	Optional	0 or more	Container
accreditingBody	accreditingBody identifies the organization that sets the quality standards for continuing education and is the source of the accreditation process for the provider of this educational activity. Recommended values for accreditingBody include: ACCME, AACN, ACPE, ANCC, AANA, AANP, AAPA, CCME, ASHA, AAA, FCLB PACE, AGD PACE, CDR, CECBEMS, AOTA, COPE, APA, ARRT RCEEM. AARC, ACSM, BOC, EBAC, RCPath, and IACET.	Optional	0 or 1	Character String (see section Character String datatype for more inform-ation)

Element	Description	Required	Multiplicity	Datatype
activityCertification	activityCertification identifies the category of credit awarded for the activity by the accredited medical education organization. Recommended values include: AAFP Prescribed, AAFP Elective, AAP, AAP Prep, ACEP, ACOG, AMA PRA Category 1, AMA PRA Category 2, AOA, APA Category 1, CECBEMS First Responder, CECBEMS Basic, CECBEMS Advanced, CECBEMS Operational, CECBEMS Educator, CECBEMS Administrator, CPHQ, EBAC CE Credit Hours, NCHEC Category 1, NCHEC Category 2, Synergy CERPS A, Synergy CERPS B, Synergy CERPS C, RCP.	Optional	0 or 1	Character String (see section Character String datatype for more inform-ation)
creditType	creditType indicates which type of credit is awarded for this educational activity. Valid values are: CME, CE, CNE, CPE, and CHES, CPD.	Optional	0 or 1	Restricted
creditUnit	creditUnit indicates the unit of credit for this credit definition. Valid values are: CECH, CEH, CEU, Cognate, Contact Hour, Credit, Hour, Unit, Credit Hour, and Point.	Optional	0 or 1	Restricted
pacing	pacing indicates who controls the pacing of the activity. Valid values are learner paced and provider paced.	Optional	0 or 1	Restricted

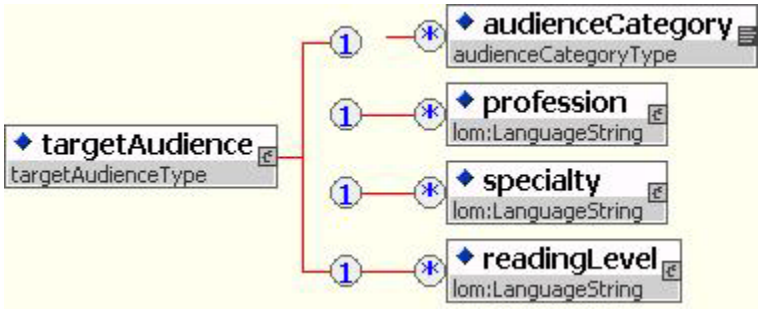
Element	Description	Required	Multiplicity	Datatype
accreditedProvider	accreditedProvider defines the entity serving as the accredited provider for this activity.	Optional	0 or 1	Character String (see section Character String datatype for more inform-ation)
nonAccreditedProvider	nonAccreditedProvider defines an educational provider for this activity that is not the accredited provider. Jointly sponsored activities have a non-accredited provider.	Optional	0 or more	Character String (see section Character String datatype for more inform-ation)
releaseDate	releaseDate identifies the date this activity becomes available for credit.	Optional	0 or 1	Date
expirationDate	expirationDate identifies the date that the activity ceases to be available for credit.	Optional	0 or 1	Date
numberOfCredits	numberOfCredits identifies the number of continuing education credits associated with this learning activity.	Optional	0 or 1	Decimal

Example:

```
<hx:credits>
   <hx:accreditingBody>ACCME</hx:accreditingBody>
   <hx:activityCertification>
    AAFP Prescibed
   </hx:activityCertification>
   <hx:creditType>CME</hx:creditType>
   <hx:creditUnit>Credits</hx:creditUnit>
   <hx:pacing>learner paced</hx:pacing>
   <hx:accreditedProvider>
    American Academy of Family Physicians
   </hx:accreditedProvider>
   <hx:releaseDate>2006-04-30</hx:releaseDate>
   <hx:expirationDate>2007-04-30</hx:expirationDate>
   <hx:numberOfCredits>1.5</hx:numberOfCredits>
</hx:credits>
```

4 targetAudience

targetAudience is the subelement of healthcareEducation that provides more information on the individuals for whom this learning content is intended.



targetAudience Information

Element	Description	Required	Multiplicity	Datatype
targetAudience	targetAudience is the subelement of healthcareEducation that provides more information on the learners for which this educational offering is intended.	Optional	0 or 1	Container
audienceCategory	audienceCategory is a subelement of targetAudience that describes the intended audience for the educational offering in broad terms. Valid values are: general, patient, caregiver, professional.	Optional	0 or more	Restricted
profession	profession is the subelement of targetAudience that describes the health profession for which this educational offering is intended. For example, physician, registered nurse, etc. See Appendix 2 for a hierarchical list of recommended values.	Optional	0 or more	LanguageString (see section LanguageString datatype for more information)
specialty	specialty is the subelement of targetAudience that describes healthcare specialties within a profession that compose part of the target audience	Optional	0 or more	LanguageString (see section LanguageString datatype for more information)

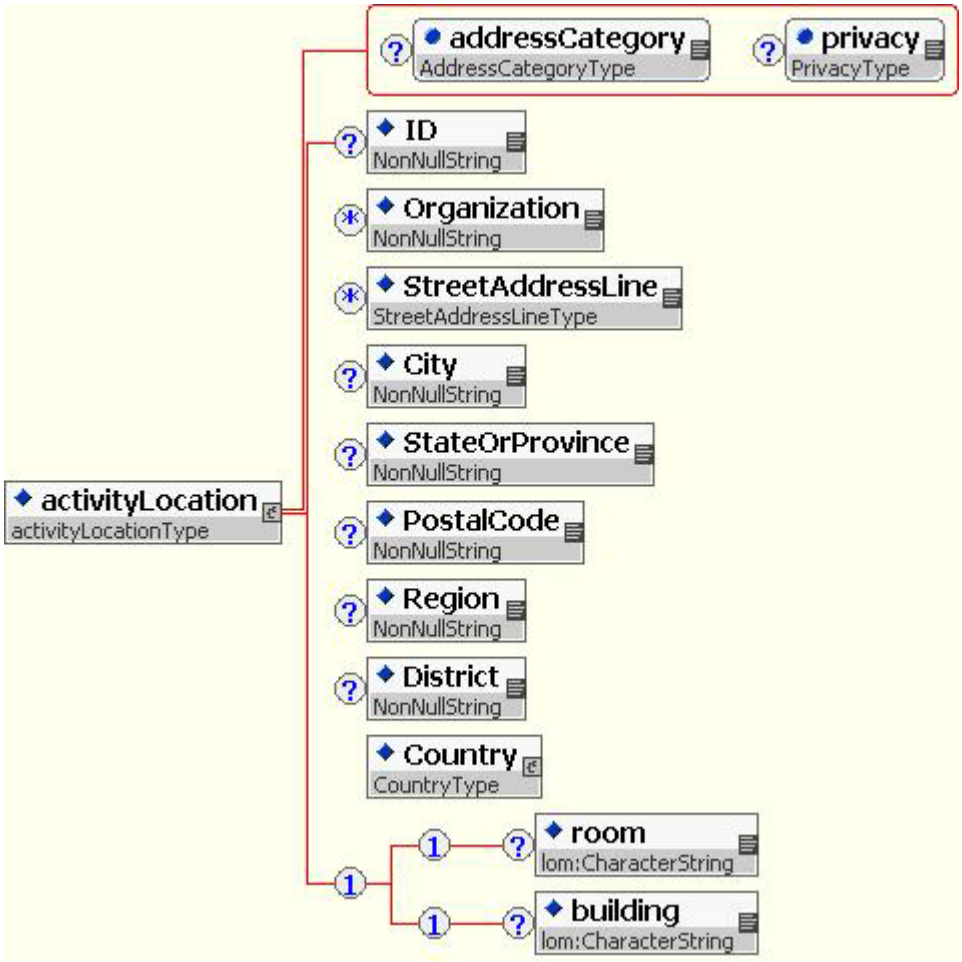
Element	Description	Required	Multiplicity	Datatype
	for this educational offering. For example, cardiology. See Appendix 2 for a list of recommended values.			
readingLevel	readingLevel is the subelement of targetAudience that describes the primary/secondary school grade reflecting the reading level of the target audience. This is normally used for non-professional education. Recommended values are: grade 1, grade 2, grade 3, grade 4, grade 5, grade 6, grade 7, grade 8, grade 9, grade 10, grade 11, grade 12, above grade 12.	Optional	0 or 1	LanguageString (see section LanguageString datatype for more information)

Example:

```
<targetAudience>
   <audienceCategory>professional</audienceCategory>
   <profession>
      <string language = "en">physician</string>
   </profession>
   <specialty>
      <string language = "en">cardiology</string>
   </specialty>
   <readingLevel>
      <string language = "en">above grade 12</string>
   </readingLevel>
</targetAudience>
```

5 activityLocation

activityLocation is the subelement of healthcareEducation that provides detailed information on the location of an in-person learning activity.



activityLocation information

Element	Description	Required	Multiplicity	Datatype
activityLocation	activityLocation indicates the geographical location in which an in person activity takes place. activityLocation extends the AddressType datatype within the MedBiquitous Professional Profile. For information on the attributes and subelements associated with an address, please see MedBiquitous Address Specifications and Description Document, ver. 1.0.	Optional	0 or 1	Container

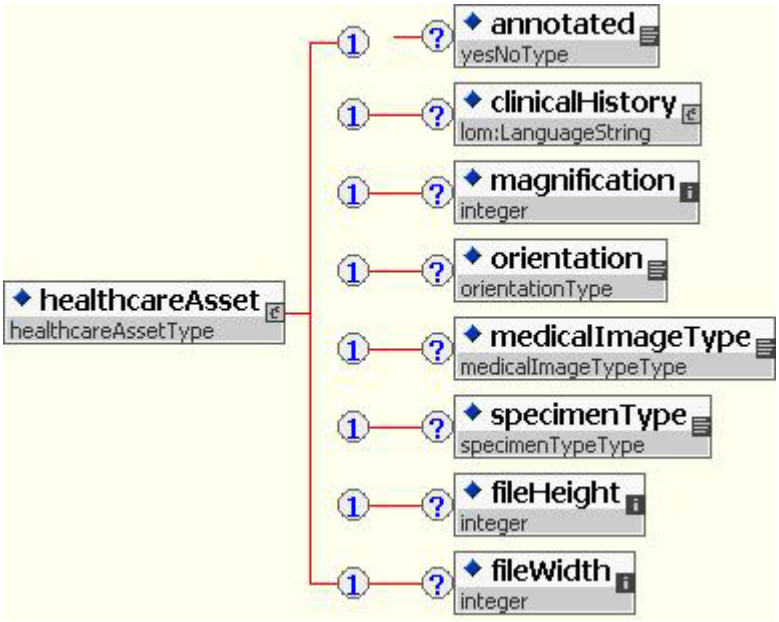
Element	Description	Required	Multiplicity	Datatype
room	Room is a subelement of activityLocation. It defines the room in which an activity takes place.	Optional	1	Character String (see section Character String datatype for more information)
building	Building is a subelement of activityLocation. It defines the building in which an activity takes place.	Optional	1	Character String (see section Character String datatype for more information)

Example:

```
   <healthcareMetadata>
      <healthcareEducation>
         <activityLocation>
            <a:Organization>Portland VA Medical Center</a:Organization>
            <a:StreetAddressLine>3710 SW US Veterans Hospital
Road</a:StreetAddressLine>
            <a:City>Portland</a:City>
            <a:StateOrProvince>Oregon</a:StateOrProvince>
            <a:PostalCode>97201</a:PostalCode>
            <a:Country>
               <a:CountryCode>US</a:CountryCode>
            </a:Country>
            <room>Schaffer Auditorium</room>
            <building>Building 101</building>
         </activityLocation>
      </healthcareEducation>
   </healthcareMetadata>
```

6 healthcareAsset

healthcareAsset is the subelement of healthcareMetadata that contains healthcare specific metadata for images, text, multimedia files, and other files that contribute to the creation of an educational offering. healthcareAsset is optional.



healthcareAsset Information

Element	Description	Required	Multiplicity	Datatype
healthcareAsset	healthcareAsset is the subelement of healthcareMetadata that provides more information about images and other files that contribute to the creation of an educational offering.	Optional	0 or 1	Container
annotated	annotated is a subelement of healthcareAsset that indicates whether or not this resource features an annotated or labeled image. Valid values are: yes, no.	Optional	0 or 1	Restricted
clinicalHistory	clinicalHistory is a subelement of healthcareAsset that describes the clinical history of the patient or subject described in this resource.	Optional	0 or 1	LanguageString (see section LanguageString datatype for more information)

Element	Description	Required	Multiplicity	Datatype
magnification	magnification is a subelelement of healthcareAsset that describes the magnification of microscopic image(s) found in this resource. For example, 100.	Optional	0 or 1	Integer
orientation	orientation is a subelelement of healthcareAsset that describes the orientation of image(s) found in this resource. Valid values are: axial, coronal, horizontal, longitudinal, sagittal, transverse.	Optional	0 or 1	Restricted
medicalImageType	medicalImageType is a subelelement of healthcareAsset that describes the type of image, radiological or otherwise, Featured in this resource. Valid values are: angiogram, computed axial tomography scan, electrocardiogram, endoscopic image, magnetic resonance image, mammogram, micrograph, nuclear medicine scan, photograph, radiograph, ultrasound.	Optional	0 or 1	Restricted
specimenType	specimenType is a subelelement of healthcareAsset that describes the type of specimen featured in this resource. Valid values are: cell, organ, organ system, organelle, tissue.	Optional	0 or 1	Restricted
fileHeight	fileHeight is the subelement of healthcareAsset that describes the height of the image in pixels.	Optional	0 or 1	Integer

Element	Description	Required	Multiplicity	Datatype
fileWidth	fileWidth is the subelement of healthcareAsset that describes the width of the image in pixels.	Optional	0 or 1	Integer

Example:

```
   <healthcareMetadata>
      <healthcareAsset>
         <annotated>no</annotated>
         <clinicalHistory>
            <string language=”en”>50 year old female with Cryptococcal
Pneumonia</string>
         </clinicalHistory>
         <medicalImageType> radiograph</medicalImageType>
         <specimenType>organ</specimenType>
         <fileHeight>500</fileHeight>
         <fileWidth>600</fileWidth>
      </healthcareAsset>
   </healthcareMetadata>
```

7 LanguageString Datatype

Many of the elements in Healthcare LOM use the LanguageString datatype from the IEEE LOM standard. LanguageString provides a way for LOM document creators to specify a value for an element in multiple languages. For example, document creators can specify a single keyword term in both French and English. Within the healthcare extensions, the faculty disclosure description can be encoded multiple languages, too. This functionality is important for those creating educational resources for a multilingual population.

Elements using the LanguageString datatype have the subelement of string, which is described in the following table.

Element	Description	Required	Multiplicity	Datatype
string	string is the subelement of any element using the LanguageString datatype. It provides a word or phrase in a human language. If the string element is repeated within a particular element, each value should be semantically equivalent, such as a translation or alternative description. String has the following attribute: *language* language specifies the human language of the text string. If the language attribute is not present, the language will be determined by the value of the language element within the LOM metaMetadata container. Valid values are codes from the ISO-10646-1 standard. For example, en for English and fr for French.	Optional	0 or more	CharacterString

In the following example, the word physician is expressed in three languages:

```
<targetAudience>
   <profession>
      <string language = "en">physician</string>
      <string language = "fr">médecin</string>
      <string language = "sp">médico</string>
   </profession>
</targetAudience>
```

8 Character String Datatype

Many of the elements and attributes in Healthcare LOM use the CharacterString data type from the IEEE LOM standard. CharacterString indicates that the data value for the element or attribute is a character string but is NOT a word or phrase in a human language. For example, a name would be encoded using the CharacterString data type.

The characters represented by this data type are from the ISO/IEC 10646-1:2000 standard. This ISO standard, also known as UCS, attempts to include all characters used in all written languages in the world.

CharacterString uses the XML string data type.

Custom Attributes

Healthcare LOM provides attribute extensions to some LOM elements to facilitate the use of LOM in healthcare and to promote interoperability with non-healthcare systems when possible.

Using Clinical Terminologies to Indicate Keyword
Medical terminologies such as MeSH, SNOMED, and UMLS provide a structure for describing healthcare topics and can facilitate indexing, cataloging and discovery of healthcare learning content. This indexing/cataloging can in turn facilitate integration of content with clinical systems and workflow.

LOM provides the keyword element to describe the important concepts or topics related to learning content. To use the keyword element with terms from medical terminologies, Healthcare LOM adds attribute extension. The syntax of the keyword element with healthcare-specific attribute extensions follows.

Element	Description	Required	Multiplicity	Datatype
keyword	keyword is the subelement of general. Its subelements provide common keywords (important concepts or topics) that describe the educational offering. **Healthcare LOM adds the following attributes to keyword:** *source* source specifies the terminology or vocabulary from which the keyword is taken. For example, UMLS, SNOMED, or MeSH. *Id* id defines the unique identifier associated with this term in the structured terminology or vocabulary. For example, D009203.	Optional	0 or 1	LanguageString (see section LanguageString datatype for more information)

Example:

```
<keyword hx:source = ″MeSH″ hx:id = ″D009203″>
   <string language = ″en″>myocardial infarction</string>
</keyword>
```

Custom Vocabularies

Healthcare LOM custom vocabularies supplement the LOM vocabularies to provide values useful for healthcare education. The table that follows describes the LOM elements for which custom vocabularies have been created, the LOM provided values for those elements, the Healthcare LOM vocabularies that serve as supplements, and the hierarchical path to the LOM element. **Values from both the LOM vocabularies or the Healthcare LOM vocabularies are considered valid values for these elements.**

Custom Vocabularies

Element	Description	LOM Vocabulary	Healthcare LOM Vocabulary	Path
source	An indication of the source or owner of the vocabulary values.	LOMv1.0	HEALTHCARE_LOMv1	Occurs with value within any element that has a defined vocabulary
role	Defines the type of contribution made by a contributor.	Author publisher unknown initiator terminator validator editor graphical designer technical implementer content provider technical validator educational validator script writer instructional designer subject matter expert	other reviewer programmer producer director	lifecycle:contribute:role

Element	Description	LOM Vocabulary	Healthcare LOM Vocabulary	Path
learningResourceType	Defines the type of educational content.	Exercise simulation questionnaire diagram figure graph index slide table narrative text exam experiment problem statement self assessment lecture	animation audio collaborative forum game case study image reference tutorial video virtual patient	educational: learningResourceType
context	The educational environment for which the learning activity is intended.	School higher education training other	patient education caregiver education primary education secondary education vocational training undergraduate education undergraduate professional education graduate professional education continuing professional development	educational:context

Element	Description	LOM Vocabulary	Healthcare LOM Vocabulary	Path
purpose	Defines a purpose for classifying the learning activity.	Discipline idea prerequisite educational objective accessibility restrictions educational level skill level security level competency	clinical guideline drug list level of evidence learning outcome	classification:purpose

Custom Elements

Healthcare LOM allows organizations to add new elements to those described in this document and in the IEEE LOM documentation. This allows organizations to further customize Healthcare LOM for their specific needs.

New elements can be added in the following ways.

Adding Elements to Existing LOM Categories

Healthcare LOM allows extensions to general, lifecycle, metaMetadata, technical; educational, rights, relation, annotation, classification, and any of their sub-elements that are also container elements. For more information on adding new elements to existing LOM category elements and their sub-elements, see IEEE Standard for Learning Technology—Extensible Markup Language (XML) Schema Definition Language Binding for Learning Object Metadata (IEEE 1484.12.3).

Adding Elements to a New Category

Healthcare LOM defines a sub-element of lom called customElements. The customElements container may contain any new elements or new categories of elements as long as those elements are qualified by an XML namespace. Healthcare LOM does not permit extensions to healthcareMetadata or its subelements, so any new elements specific to healthcare should be placed in the customElements container.

Example:

```
<lom xmlns="http://ltsc.ieee.org/xsd/LOM"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:hx="http://ns.medbiq.org/lom/extend/v1/"
xmlns:new="http://your.organization.org/lom/extend/v1/"
xsi:schemaLocation="http://ltsc.ieee.org/xsd/LOM healthcarelom.xsd">
   <general>
      ...
   </general>
   ...
   <hx:customElements>
      <new:curriculumPlacement>
         <new:curriculumRequirementSatisfied>
            Pain Management
         </new:curriculumRequirementSatisfied>
         <new:medicalSchoolYear>1</new:medicalSchoolYear>
      </new:curriculumPlacement>
   </hx:customElements>
```

Conformance

To be a conformant instance of Healthcare LOM, an XML document:

- Shall validate against the Healthcare LOM (ANSI /MEDBIQ LO.10.1-200x) XML schema available at http://ns.medbiq.org/lom/extend/v1/healthcarelom.zip
- Shall be a conforming XML instance of LOM as defined by IEEE Standard for Learning Technology--Extensible Markup Language (XML) Schema Definition Language Binding for Learning Object Metadata (IEEE 1484.12.3)
- Shall conform to the Additional Requirements stated in this document
- May include elements not defined in this document or in the IEEE Standard for Learning Technology--Extensible Markup Language (XML) Schema Definition Language Binding for Learning Object Metadata (IEEE 1484.12.3) by using the customElements container defined in the section Custom Elements.

Additional Requirements

The metadata document must indicate that it is conformant with the LOM version 1.0, SCORM Content Aggregation Model version 1.3 (if applicable), and Healthcare LOM version 1 standards. To indicate this conformance, include the following XML code in the metaMetadata section of the metadata record:

```
<metadataSchema>LOMv1.0</metadataSchema>
<metadataSchema>SCORM_CAM_v1.3</metadataSchema>
<metadataSchema>HEALTHCARE_LOMv1</metadataSchema>
```

References

IEEE Standard for Learning Object Metadata, 1484.12.1-2002, http://ieeexplore.ieee.org/servlet/opac?punumber=8032

IEEE Standard for Learning Technology-Extensible Markup Language (XML) Schema Definition Language Binding for Learning Object Metadata, 1484.12.3-2005, http://ieeexplore.ieee.org/servlet/opac?punumber=10263

MedBiquitous Address Specifications and Description Document v1.0, http://www.medbiq.org/working_groups/professional_profile/AddressSpecification.pdf

MedBiquitous XML Schema Design Guidelines v1.3, http://www.medbiq.org/technology/tech_architecture/xmldesignguidelines.pdf

W3C Extensible Markup Language (XML) 1.0 (Fourth Edition), http://www.w3.org/TR/xml

Appendix 1: Credit Related Acronyms

Credit-related Acronyms

AAA	American Academy of Audiology
AACN	American Association of Critical-Care Nurses
AAFP	American Academy of Family Physicians
AANA	American Association of Nurse Anesthetists
AANP	American Academy of Nurse Practitioners
AAP	American Academy of Pediatrics
AAPA	American Academy of Physician Assistants
AARC	American Association for Respiratory Care
ACCME	Accreditation Council of Continuing Medical Education
ACEP	American College of Emergency Physicians
ACOG	American College of Obstetrics and Gynecology
ACPE	Accreditation Council for Pharmacy Education
ACSM	American College of Sports Medicine
ADA CERP	American Dental Association Continuing Education Recognition Program
AGD PACE	Academy of General Dentistry Program Approval for Continuing Education
AMA PRA	American Medical Association Physician Recognition Award
ANCC	American Nurses Credentialing Center
AOA	American Osteopathic Association
AOTA	American Occupational Therapy Association
APA	American Psychological Association
ARRT RCEEM	American Registry of Radiologic Technologists Recognized Continuing Education Evaluation Mechanism
ASHA	American Speech-Language-Hearing Association
BOC	Board of Certification (for athletic trainers)
CCME	Council on Continuing Medical Education (for osteopathic professionals)
CDR	Commission on Dietetic Registration
CECBEMS	Continuing Education Coordinating Board for Emergency Medical Services
CE	Continuing Education
CECH	Continuing Education Contact Hour
CEH	Continuing Education Hours
CERP	Continuing Education Recognition Point (for critical-care nurses)
CEU	Continuing Education Units
CHES	Certified Health Education Specialists

CME	Continuing Medical Education
CNE	Continuing Nursing Education
COPE	Council on Optometric Practitioner Education
CPE	Continuing Pharmacy Education
CPHQ	Certified Professional in Healthcare Quality
EBAC	European Board of Accreditation in Cardiology
FCLB PACE	Federation of Chiropractic Licensing Boards Providers of Approved Continuing Education
IACET	International Association for Continuing Education and Training
NCHEC	National Commission for Health Education Credentialing
RCPath	Royal College of Pathologists

Appendix 2: Health Professions and Specialties

Following are recommended terms for health professions and health specialties that should capture the needs of most health professions educators. They are intended to provide guidance for those organizations seeking to describe the professional audience for an educational offering in a consistent manner. The list of professionals is adapted from a list created by the US Health Resources and Services Administration. The list of health specialties is adapted from specialties and internal medicine/pediatric subspecialties as recognized by the Accreditation Council on Graduate Medical Education and the American Board of Medical Specialties. These lists may not be adequate to meet the needs of hospitals and large healthcare organizations requiring a highly detailed hierarchical list of professions. More detailed lists of healthcare professionals have been defined by HL7, SNOMED, the US Health Resources and Services Administration, the US Office of Program Management, and the National Center of Educational Statistics (Classification of Instructional Programs).

Either higher or lower level terms in the hierarchy may be used when describing health professions.

Health Professions
allied health professional
chiropractor
dietician
emergency medical services professional
laboratory professional
medical assistant
medical examiner / coroner
medical imaging professional
mental health counselor
occupational therapist
optician
optometrist
physical therapist
physician assistant
podiatrist
psychologist
rehabilitation professional
respiratory therapy professional
social worker
speech, language, audiology professional

Health Professions (continued)	
allied health professional (continued)	substance abuse counselor
dental professional	
	dentist
medical professional	
	physician
nursing professional	
	advanced practice nurse
	licensed practical nurse
	registered nurse
pharmacy professional	
	pharmacist
public health professional	
	environmental health professional
	epidemiologist
	health educator
	occupational health and safety professional
veterinary professional	
	veterinarian

Health Specialties

- adolescent medicine
- allergy/immunology
- anesthesiology
- cardiology
- colon and rectal surgery
- critical care medicine
- dermatology
- developmental-behavioral
- emergency medicine
- endocrinology
- family practice
- gastroenterology
- geriatric medicine
- hematology and oncology
- infectious disease
- internal medicine

- medical genetics
- neonatal-perinatal medicine
- nephrology
- neurological surgery
- neurology
- nuclear medicine
- obstetrics and gynecology
- ophthalmology
- orthopaedic surgery
- otolaryngology
- pathology-anatomic and clinical
- pediatrics
- physical medicine and rehabilitation
- plastic surgery
- preventive medicine
- psychiatry
- pulmonology
- radiation oncology
- radiology-diagnostic
- rheumatology
- sports medicine
- surgery-general
- thoracic surgery
- urology

Appendix 3: Sample XML Documents

Sample XML for Describing a Learning Object or Course

```
<?xml version="1.0" encoding="UTF-8"?>
<lom xmlns="http://ltsc.ieee.org/xsd/LOM"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:hx="http://ns.medbiq.org/lom/extend/v1/"
xsi:schemaLocation="http://ltsc.ieee.org/xsd/LOM healthcarelom.xsd">
   <general>
      <identifier>
         <catalog>URL</catalog>
         <entry>http://www.aafp.org/x29766.xml</entry>
      </identifier>
      <title>
         <string language="en">Insulin Pump Therapy</string>
      </title>
      <description>
         <string language="en">Provides a general introduction to Continuous
Subcutaneous Insulin Infusion for the family practice physician.</string>
      </description>
      <keyword hx:source="MeSH" hx:id="D007332">
         <string language="en">insulin infusion systems</string>
      </keyword>
      <keyword hx:source="MeSH" hx:id="D003920">
         <string language="en">diabetes mellitus</string>
      </keyword>
   </general>
   <lifeCycle>
      <version>
         <string language="en">1.0</string>
      </version>
      <status>
         <source>LOMv1.0</source>
         <value>final</value>
      </status>
      <contribute>
         <role>
            <source>LOMv1.0</source>
            <value>author</value>
         </role>
         <entity>BEGIN:VCARD\nFN:John DoeEND:VCARD</entity>
      </contribute>
      <contribute>
         <role>
            <source>LOMv1.0</source>
            <value>publisher</value>
         </role>
         <entity>BEGIN:VCARD\nFN:American Academy of Family
PhysiciansEND:VCARD</entity>
         <date>
            <dateTime>2004-08-01</dateTime>
            <description>
               <string language="en">Publication date</string>
```

```
            </description>
         </date>
      </contribute>
   </lifeCycle>
   <metaMetadata>
      <identifier>
         <catalog>URL</catalog>
         <entry>http://www.aafp.org/metadata/001</entry>
      </identifier>
      <contribute>
         <role>
            <source>LOMv1.0</source>
            <value>creator</value>
         </role>
         <entity>American Academy of Family  Physicians</entity>
         <date>
            <dateTime>2004-08-01</dateTime>
         </date>
      </contribute>
      <metadataSchema>LOMv1.0</metadataSchema>
      <metadataSchema>SCORM_CAM_v1.3</metadataSchema>
      <metadataSchema>HEALTHCARE_LOMv1</metadataSchema>
   </metaMetadata>
   <technical>
      <format>application/http</format>
   </technical>
   <educational>
      <context>
         <source>HEALTHCARE_LOMv1</source>
         <value>continuing professional development</value>
      </context>
   </educational>
   <rights>
      <cost>
         <source>LOMv1.0</source>
         <value>yes</value>
      </cost>
      <copyrightAndOtherRestrictions>
         <source>LOMv1.0</source>
         <value>yes</value>
      </copyrightAndOtherRestrictions>
      <description>
         <string language="en">Copyright American Academy of Family
Physicians, 2004. All Rights Reserved.</string>
      </description>
   </rights>
   <classification>
      <purpose>
         <source>LOMv1.0</source>
         <value>educational objective</value>
      </purpose>
      <description>
         <string language="en">List the indications and advantages of
Continuous Subcutaneous Insulin therapy.</string>
      </description>
   </classification>
   <classification>
```

```
      <purpose>
         <source>LOMv1.0</source>
         <value>educational objective</value>
      </purpose>
      <description>
         <string language="en">Manage the programming of the insulin pump and
recognize problems when they occur.</string>
      </description>
   </classification>
   <classification>
      <purpose>
         <source>LOMv1.0</source>
         <value>competency</value>
      </purpose>
      <taxonPath>
         <source>
            <string language="en">ACGME Core Competencies</string>
         </source>
         <taxon>
            <id>b</id>
            <entry>
               <string language="en">Medical Knowledge</string>
            </entry>
         </taxon>
      </taxonPath>
   </classification>
   <hx:healthcareMetadata>
      <hx:healthcareEducation>
         <hx:expirationDate>2007-04-30</hx:expirationDate>
         <hx:creditsAvailable>yes</hx:creditsAvailable>
         <hx:credits>
            <hx:accreditingBody>ACCME</hx:accreditingBody>
            <hx:activityCertification>AAFP
Prescibed</hx:activityCertification>
            <hx:creditType>CME</hx:creditType>
            <hx:creditUnit>Credits</hx:creditUnit>
            <hx:pacing>learner paced</hx:pacing>
            <hx:accreditedProvider>
              American Academy of Family Physicians
            </hx:accreditedProvider>
            <hx:releaseDate>2006-04-30</hx:releaseDate>
            <hx:expirationDate>2007-04-30</hx:expirationDate>
            <hx:numberOfCredits>1.5</hx:numberOfCredits>
         </hx:credits>
         <hx:targetAudience>
            <hx:audienceCategory>professional</hx:audienceCategory>
            <hx:profession>
               <string language="en">physician</string>
            </hx:profession>
            <hx:specialty>
               <string language="en">family practice</string>
            </hx:specialty>
            <hx:readingLevel>
               <string language="en">above grade 12</string>
            </hx:readingLevel>
         </hx:targetAudience>
         <hx:activitySponsorship>direct</hx:activitySponsorship>
```

```
          <hx:participationModality>
            technology based
          </hx:participationModality>
          <hx:activityDelivery>not live</hx:activityDelivery>
          <hx:activityFormat>
             <string language="en">course</string>
          </hx:activityFormat>
          <hx:commercialSupport>yes</hx:commercialSupport>
          <hx:commercialSupportAcknowledgement>
             <string language="en">The Academy gratefully acknowledges a grant
from the XYZ Foundation to provide funding for this course.</string>
          </hx:commercialSupportAcknowledgement>
          <hx:relevantFinancialRelationship>
            no
          </hx:relevantFinancialRelationship>
          <hx:contact>John Doe, jdoe@aafp.org</hx:contact>
       </hx:healthcareEducation>
    </hx:healthcareMetadata>
</lom>
```

Sample XML for Describing a Learning Object or Course with Multiple Types of Credit

```
<?xml version="1.0" encoding="UTF-8"?>
<lom xmlns="http://ltsc.ieee.org/xsd/LOM"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:hx="http://ns.medbiq.org/lom/extend/v1/"
xsi:schemaLocation="http://ltsc.ieee.org/xsd/LOM healthcarelom.xsd">
   <general>
      <identifier>
         <catalog>URL</catalog>
         <entry>http://www.atsdr.cdc.gov/HEC/CSEM/arsenic/index.html</entry>
      </identifier>
      <title>
         <string language="en">Arsenic Toxicity</string>
      </title>
      <language>en</language>
      <description>
         <string language="en">Provides a general introduction to arsenic
toxicity in the environment.</string>
      </description>
      <keyword hx:source="MeSH" hx:id="D001151">
         <string language="en">arsenic</string>
      </keyword>
      <keyword hx:source="MeSH" hx:id="D019550">
         <string language="en">environmental medicine</string>
      </keyword>
   </general>
   <lifeCycle>
      <version>
         <string language="en">1.0</string>
      </version>
      <status>
         <source>LOMv1.0</source>
         <value>final</value>
      </status>
      <contribute>
         <role>
            <source>LOMv1.0</source>
            <value>author</value>
         </role>
         <entity>BEGIN:VCARD\nFN:John DoeEND:VCARD</entity>
      </contribute>
      <contribute>
         <role>
            <source>LOMv1.0</source>
            <value>publisher</value>
         </role>
         <entity>BEGIN:VCARD\nFN:Centers for Disease Control and
PreventionEND:VCARD</entity>
         <date>
            <dateTime>2005-10-30</dateTime>
            <description>
               <string language="en">Publication date</string>
            </description>
         </date>
      </contribute>
```

```
   </lifeCycle>
   <metaMetadata>
      <identifier>
         <catalog>URL</catalog>
         <entry>http://www.cd.gov/metadata/001</entry>
      </identifier>
      <contribute>
         <role>
            <source>LOMv1.0</source>
            <value>creator</value>
         </role>
         <entity>Centers for Disease Control and Prevention</entity>
         <date>
            <dateTime>2005-10-30</dateTime>
         </date>
      </contribute>
      <metadataSchema>LOMv1.0</metadataSchema>
      <metadataSchema>SCORM_CAM_v1.3</metadataSchema>
      <metadataSchema>HEALTHCARE_LOMv1</metadataSchema>
   </metaMetadata>
   <technical>
      <format>application/http</format>
      <location>http://www.atsdr.cdc.gov/HEC/CSEM/arsenic/index.html
      </location>
   </technical>
   <educational>
      <context>
         <source>HEALTHCARE_LOMv1</source>
         <value>continuing professional development</value>
      </context>
   </educational>
   <rights>
      <cost>
         <source>LOMv1.0</source>
         <value>no</value>
      </cost>
      <copyrightAndOtherRestrictions>
         <source>LOMv1.0</source>
         <value>no</value>
      </copyrightAndOtherRestrictions>
   </rights>
   <classification>
      <purpose>
         <source>LOMv1.0</source>
         <value>educational objective</value>
      </purpose>
      <description>
         <string language="en">Discuss the major exposure route for
arsenic</string>
      </description>
   </classification>
   <classification>
      <purpose>
         <source>LOMv1.0</source>
         <value>educational objective</value>
      </purpose>
      <description>
```

```
         <string language="en">Describe two potential environmental and
occupational sources of arsenic exposure</string>
      </description>
   </classification>
   <classification>
      <purpose>
         <source>LOMv1.0</source>
         <value>educational objective</value>
      </purpose>
      <description>
         <string language="en">Identify evaluation and treatment protocols
for persons exposed to arsenic</string>
      </description>
   </classification>
   <classification>
      <purpose>
         <source>LOMv1.0</source>
         <value>competency</value>
      </purpose>
      <taxonPath>
         <source>
            <string language="en">ACGME Core Competencies</string>
         </source>
         <taxon>
            <id>b</id>
            <entry>
               <string language="en">Medical Knowledge</string>
            </entry>
         </taxon>
      </taxonPath>
   </classification>
   <hx:healthcareMetadata>
      <hx:healthcareEducation>
         <hx:expirationDate>2006-10-30</hx:expirationDate>
         <hx:creditsAvailable>yes</hx:creditsAvailable>
         <hx:credits>
            <hx:accreditingBody>ACCME</hx:accreditingBody>
            <hx:activityCertification>AMA PRA category
1</hx:activityCertification>
            <hx:creditType>CME</hx:creditType>
            <hx:creditUnit>Credit</hx:creditUnit>
            <hx:accreditedProvider>Centers for Disease Control and
Prevention</hx:accreditedProvider>
            <hx:releaseDate>2005-10-30</hx:releaseDate>
            <hx:expirationDate>2006-10-30</hx:expirationDate>
            <hx:numberOfCredits>1.5</hx:numberOfCredits>
         </hx:credits>
         <hx:credits>
            <hx:accreditingBody>ANCC</hx:accreditingBody>
            <hx:creditType>CNE</hx:creditType>
            <hx:creditUnit>Contact Hour</hx:creditUnit>
            <hx:pacing>learner paced</hx:pacing>
            <hx:accreditedProvider>Centers for Disease Control and
Prevention</hx:accreditedProvider>
            <hx:releaseDate>2005-10-30</hx:releaseDate>
            <hx:expirationDate>2006-10-30</hx:expirationDate>
            <hx:numberOfCredits>1.7</hx:numberOfCredits>
```

```
         </hx:credits>
         <hx:targetAudience>
            <hx:audienceCategory>professional</hx:audienceCategory>
            <hx:profession>
               <string language="en">physician</string>
            </hx:profession>
            <hx:profession>
               <string language="en">registered nurse</string>
            </hx:profession>
            <hx:specialty>
               <string language="en">family practice</string>
            </hx:specialty>
            <hx:readingLevel>
               <string language="en">above grade 12</string>
            </hx:readingLevel>
         </hx:targetAudience>
         <hx:activitySponsorship>direct</hx:activitySponsorship>
         <hx:participationModality>technology
based</hx:participationModality>
         <hx:activityDelivery>not live</hx:activityDelivery>
         <hx:activityFormat>
            <string language="en">course</string>
         </hx:activityFormat>
         <hx:commercialSupport>no</hx:commercialSupport>
         <hx:relevantFinancialRelationship>
            no
         </hx:relevantFinancialRelationship>
         <hx:contact>John Doe, jdoe@cdc.gov</hx:contact>
      </hx:healthcareEducation>
   </hx:healthcareMetadata>
</lom>
```

Sample XML for Describing an Asset

```
<?xml version="1.0" encoding="UTF-8"?>
<lom xmlns="http://ltsc.ieee.org/xsd/LOM"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:hx="http://ns.medbiq.org/lom/extend/v1/"
xsi:schemaLocation="http://ltsc.ieee.org/xsd/LOM healthcarelom.xsd ">
   <general>
      <identifier>
         <catalog>URL</catalog>
         <entry>
          http://www.medicalschool.edu/images/dialysisdrainage.jpg
         </entry>
      </identifier>
      <title>
         <string language="en">Drainage of Dialysis Fluid from Peritoneal
Cavity</string>
      </title>
      <description>
         <string language="en">Drainage of dialysis fluid in peritoneal
cavity with catheter in pouch of Douglas.</string>
      </description>
      <keyword hx:source="MeSH" hx:id="D002404">
         <string language="en">Catheterization</string>
      </keyword>
      <keyword hx:source="MeSH" hx:id="D015314">
         <string language="en">Dialysis Solutions</string>
      </keyword>
   </general>
   <lifeCycle>
      <contribute>
         <role>
            <source>LOMv1.0</source>
            <value>publisher</value>
         </role>
         <entity>BEGIN:VCARD\nFN:Anystate Medical SchoolEND:VCARD</entity>
      </contribute>
   </lifeCycle>
   <metaMetadata>
      <identifier>
         <catalog>URL</catalog>
         <entry>http://www.medicalschool.edu/metadata/metadata010</entry>
      </identifier>
      <metadataSchema>LOMv1.0</metadataSchema>
      <metadataSchema>HEALTHCARE_LOMv1</metadataSchema>
   </metaMetadata>
   <technical>
      <format>image/jpg</format>
      <size>135090</size>
   </technical>
   <educational>
      <learningResourceType>
         <source>HEALTHCARE_LOMv1</source>
         <value>image</value>
      </learningResourceType>
   </educational>
```

```
   <rights>
      <cost>
         <source>LOMv1.0</source>
         <value>no</value>
      </cost>
      <copyrightAndOtherRestrictions>
         <source>LOMv1.0</source>
         <value>yes</value>
      </copyrightAndOtherRestrictions>
      <description>
         <string language="en">Creative Commons Attribution-Noncommercial-
Sharealike license. Contact Joe Shmoe at jshmoe@medicalschool.edu for more
information.</string>
      </description>
   </rights>
   <hx:healthcareMetadata>
      <hx:healthcareAsset>
         <hx:annotated>yes</hx:annotated>
         <hx:orientation>sagittal</hx:orientation>
         <hx:specimenType>organ system</hx:specimenType>
         <hx:fileHeight>736</hx:fileHeight>
         <hx:fileWidth>806</hx:fileWidth>
      </hx:healthcareAsset>
   </hx:healthcareMetadata>
</lom>
```