IMPLEMENTATION OF COMMON DATA ELEMENTS IN AN INTERACTIVE MULTIMEDIA REPORTING SYSTEM

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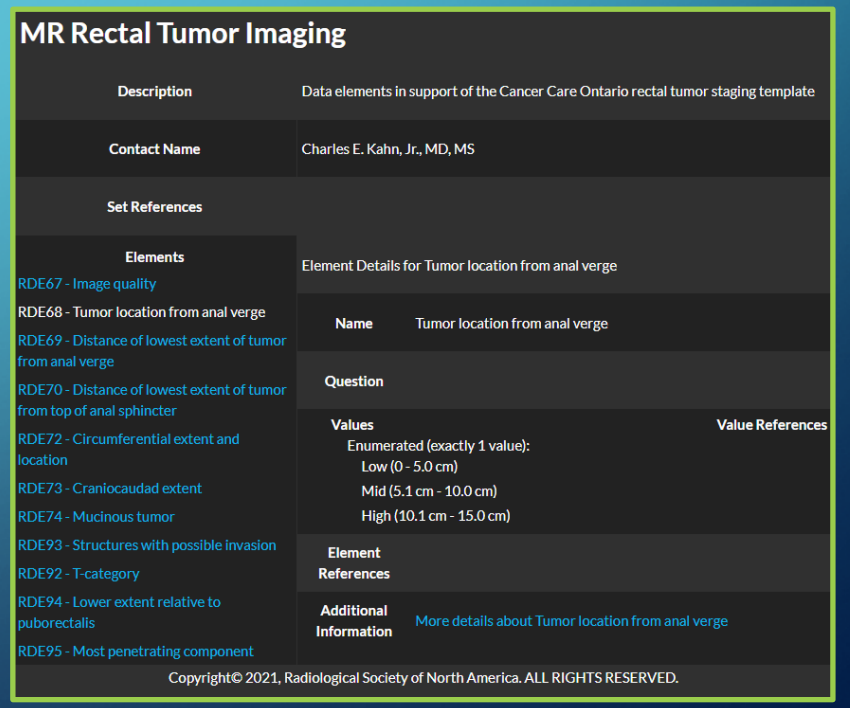
PURPOSE:

- The RSNA defines common data elements (CDEs) as “standardized sets of questions and allowable answers used to express observations in diagnoses”.
- CDEs are a vital component of structured reporting as they provide details about a disease using standardized terminology that can be indexed, searched and transmitted across electronic health record systems.
- However, widespread adoption and implementation of CDEs remains limited.
- A framework for using CDEs in an interactive multimedia reporting environment is presented in this exhibit.



MR Rectal Tumor Imaging

Description	Data elements in support of the Cancer Care Ontario rectal tumor staging template
Contact Name	Charles E. Kahn, Jr., MD, MS
Set References	

Elements

RDE67 - Image quality
RDE68 - Tumor location from anal verge
RDE69 - Distance of lowest extent of tumor from anal verge
RDE70 - Distance of lowest extent of tumor from top of anal sphincter
RDE72 - Circumferential extent and location
RDE73 - Craniocaudad extent
RDE74 - Mucinous tumor
RDE93 - Structures with possible invasion
RDE92 - T-category
RDE94 - Lower extent relative to puborectalis
RDE95 - Most penetrating component

Element Details for Tumor location from anal verge

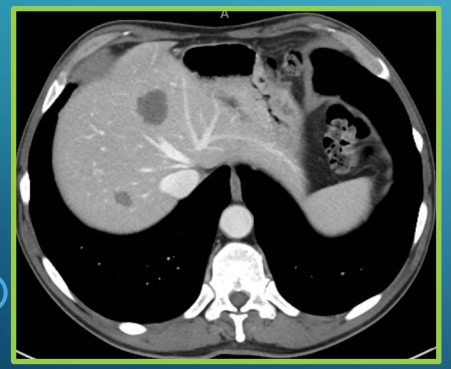
Name	Tumor location from anal verge
Question	
Values	Enumerated (exactly 1 value): Low (0 - 5.0 cm) Mid (5.1 cm - 10.0 cm) High (10.1 cm - 15.0 cm)
Value References	
Element References	
Additional Information	More details about Tumor location from anal verge

Example of CDE from https://radelement.org

METHODS:

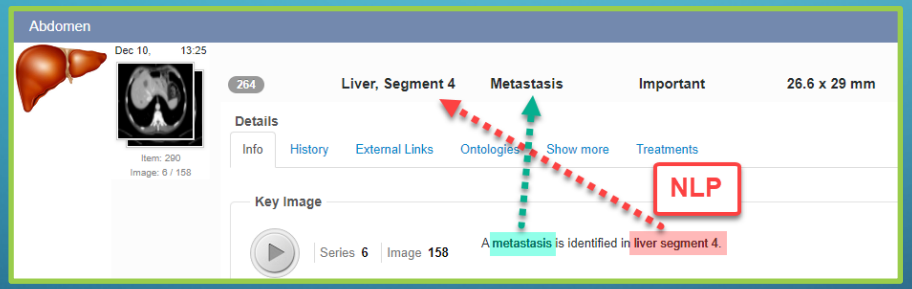
- An interactive multimedia reporting system was developed that works as follows:
  1. Record key images and voice descriptions of image findings
  2. Tag the images with metadata using natural language processing (NLP) that describes anatomy, pathology, and common data elements (CDEs)
  3. Assemble multimedia report with related information arranged in graphical timelines

Step 1: Record images/voice



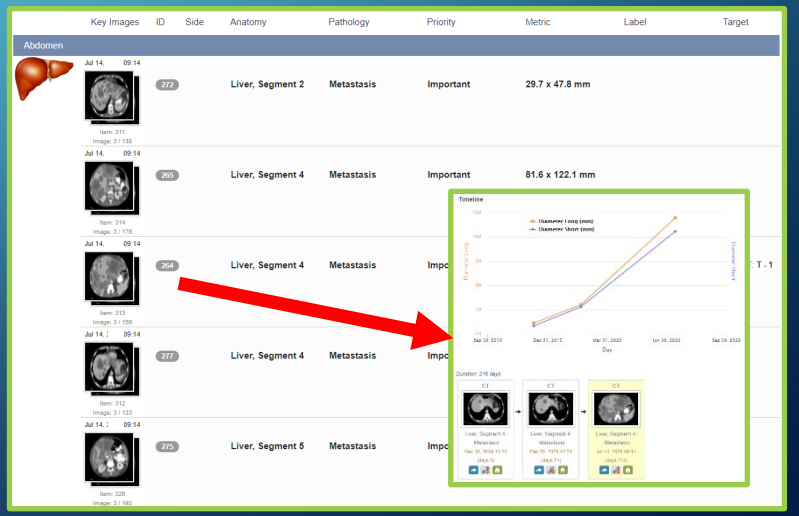
A metastasis is identified in liver segment 4.

Step 2: Tag with metadata



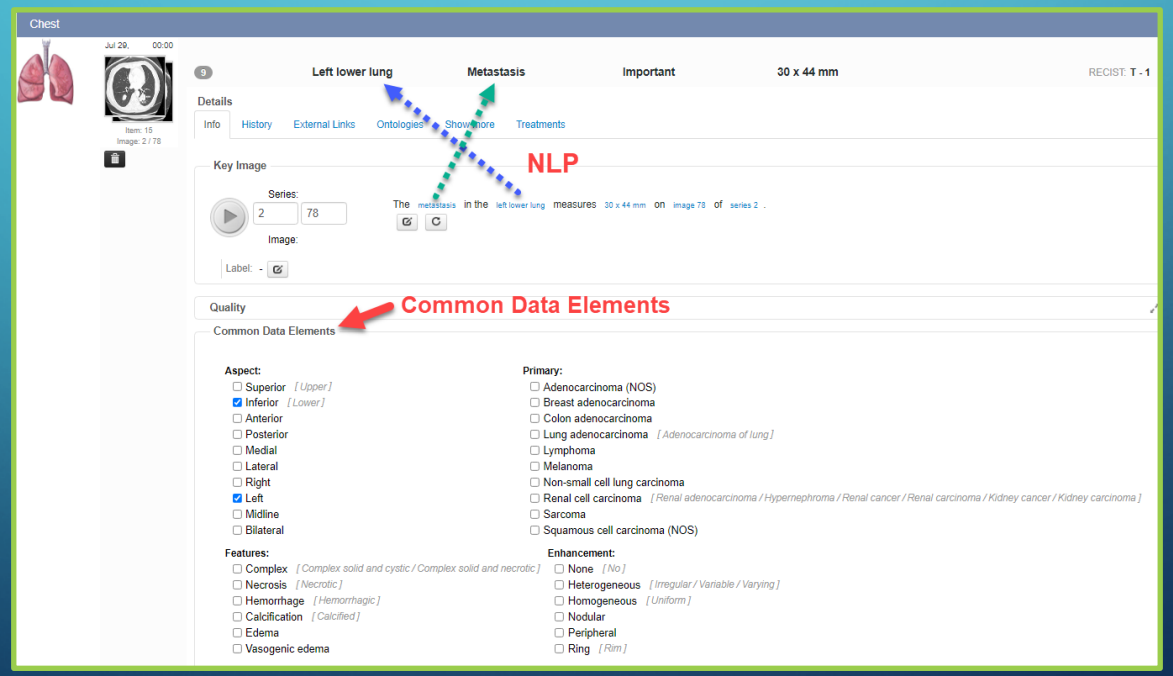
Disease metrics and series/image numbers are transmitted automatically using PACS API.

Step 3: Assemble multimedia report



METHODS:

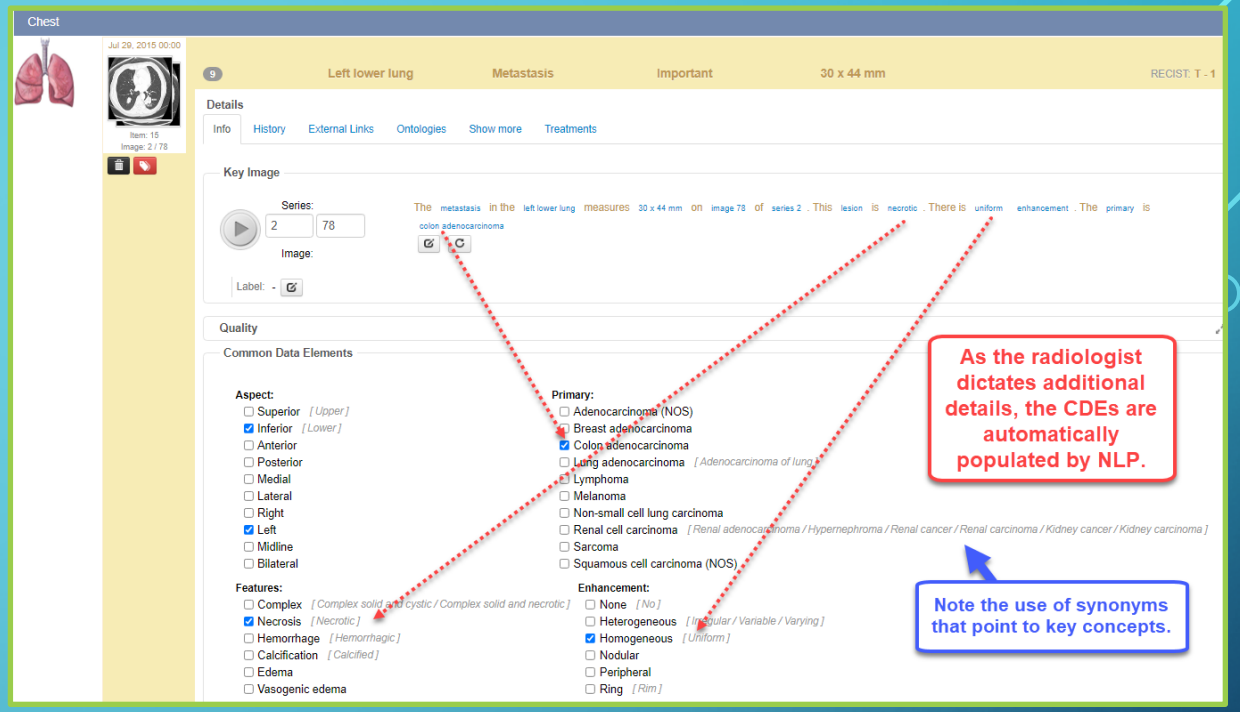
- The metadata that tags each finding consists of Anatomy and Pathology (aka, Diagnosis) terminology referenced to an ontology (i.e., controlled vocabulary).
- Anatomy and Pathology labeling triggers the display of relevant CDE menus to guide and inform radiologists about what to say about a particular diagnosis.



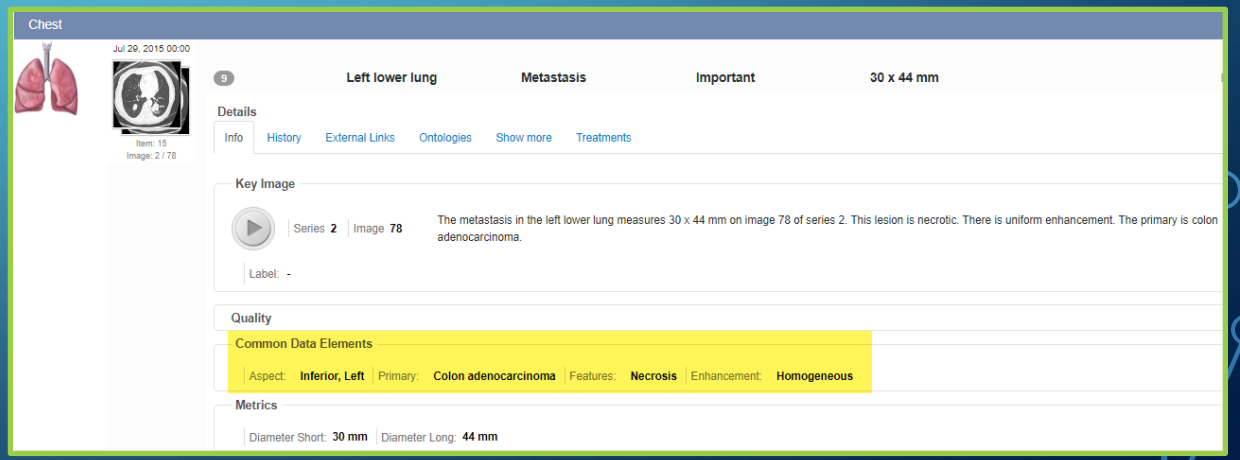
Display of CDEs triggered by Anatomy-Pathology terms (Left lower lung – Metastasis)

METHODS:

- As the radiologist dictates additional information about a finding, the NLP searches the transcribed text for CDE elements to populate the appropriate fields in the multimedia report.
- Signed reports only display selected CDEs.



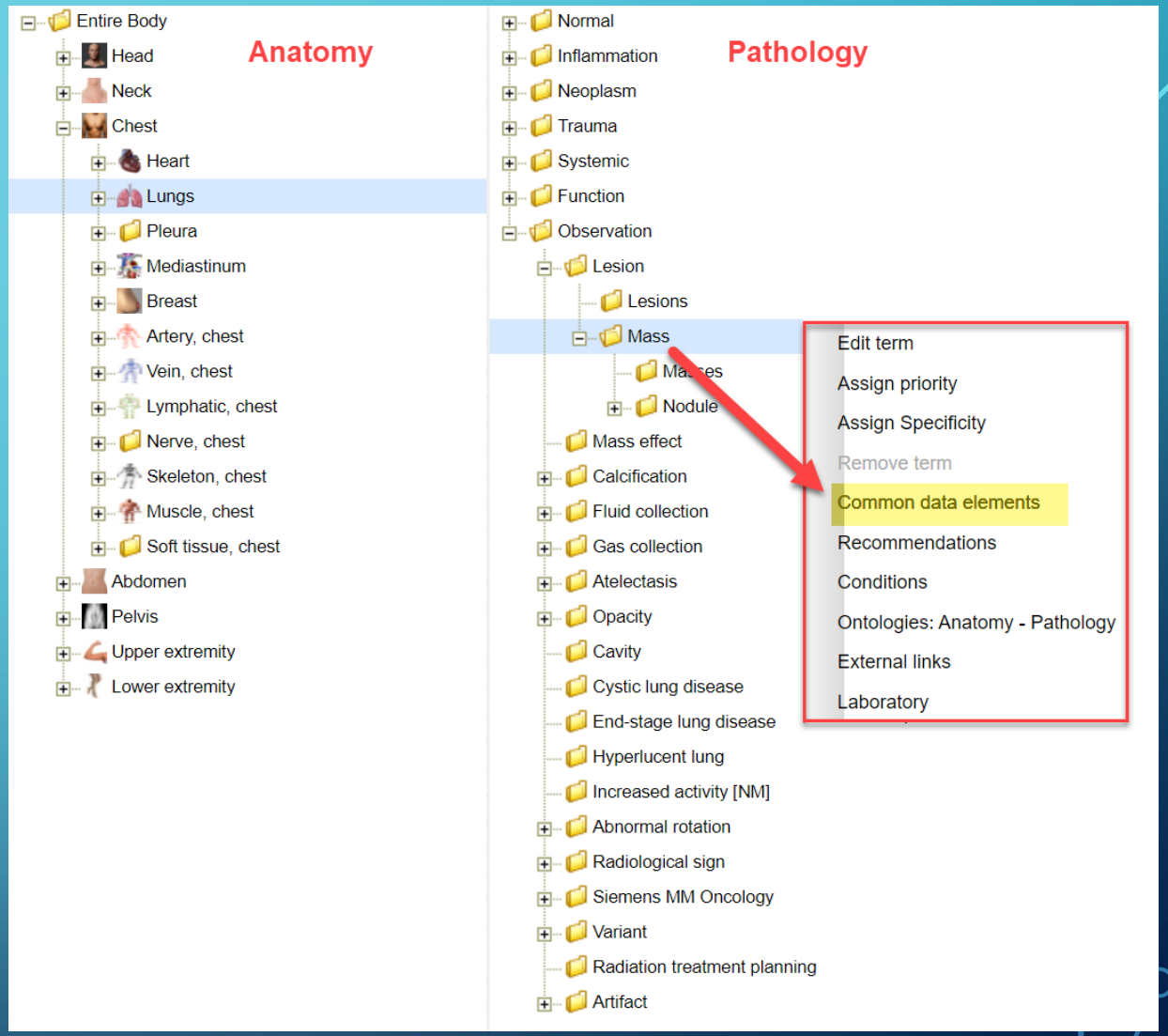
CDEs are automatically populated as more details are described



After signing a report, only selected CDEs are displayed

METHODS:

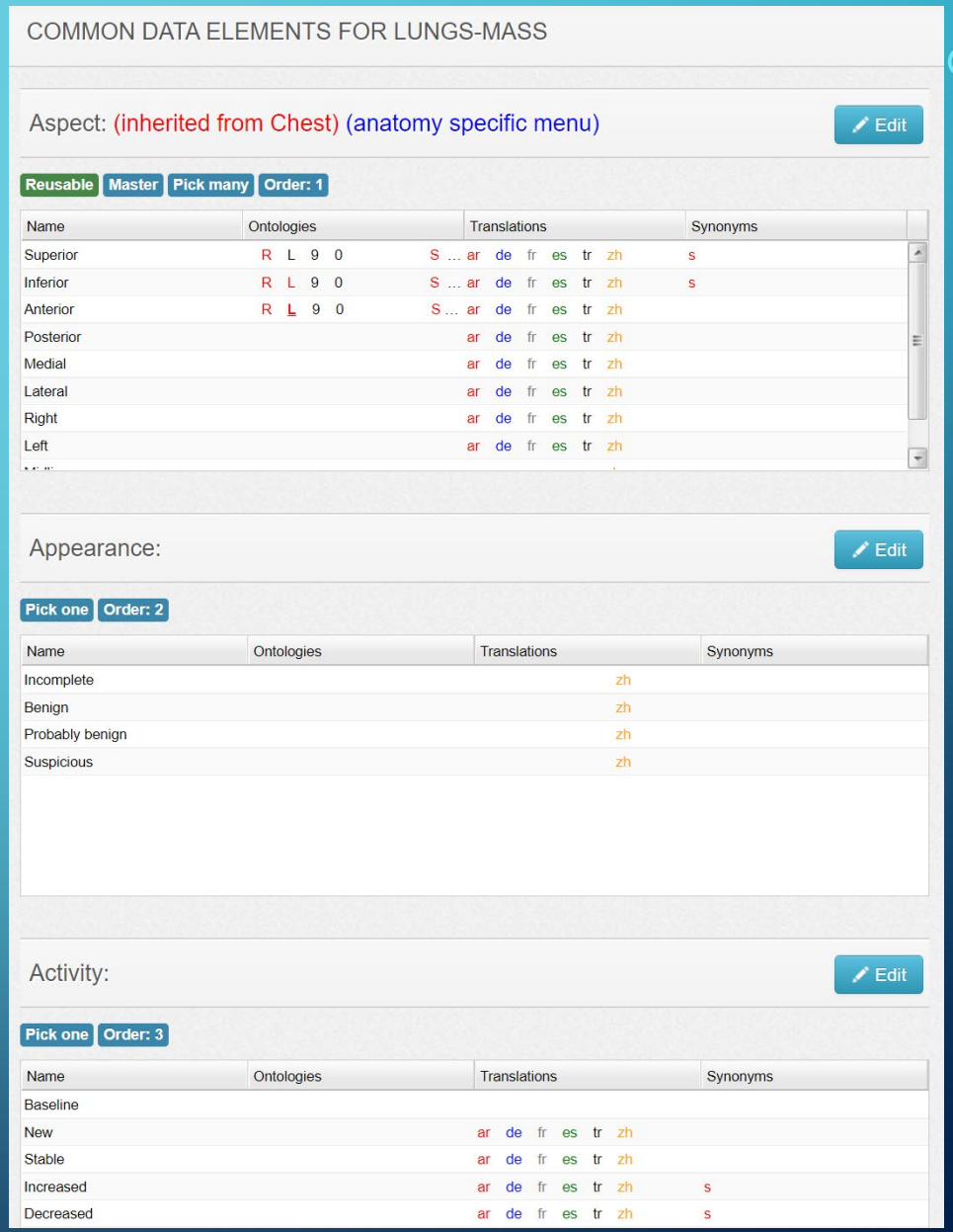
- The ontology used to label each finding consists of hierarchies of Anatomy and Pathology terms
- CDEs applied to a parent term within the hierarchies may be transmitted to a child (i.e., inheritance) or blocked by design.



Each anatomy term is associated with a pathology tree. Right-mouse button click accesses CDE authoring tool.

METHODS:

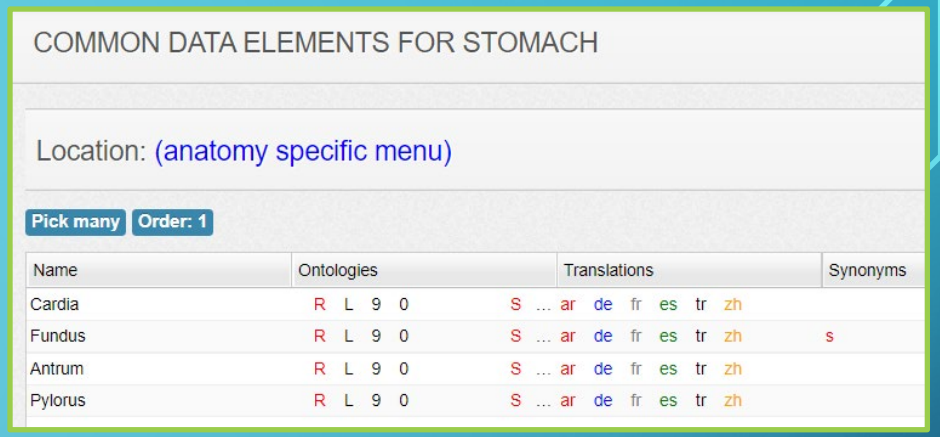
- The authoring application that supports CDEs allows for menus of questions and answers to be constructed with the following options:
  - Pick list with single answer
  - Pick list will multiple-choice answers
  - Fill-in-the blank field with free text
  - Fill-in-the blank field with disease metrics



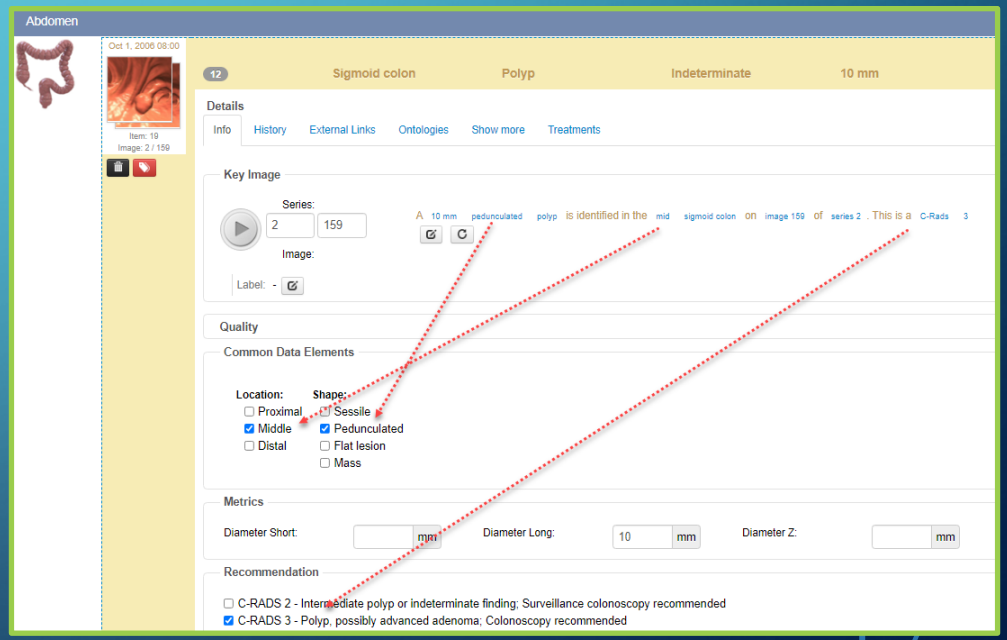
CDEs for Lung-Mass derived from ACR's Lung-RADS

METHODS:

- CDEs may be applied to the following to allow for versatility in their application:
  - Anatomy terms
  - Pathology terms
  - Anatomy-Pathology term combinations
- CDEs are cross-referenced to multiple ontologies, including SNOMED, RadLex, ICD-10, and others.
- CDEs applied to a particular anatomical term, for example “muscle,” may be transmitted to all occurrences of muscle terminology across the ontology (i.e., transference).



CDEs specific for the anatomical parts of the Stomach



CDEs for Colon-Polyp term combination, including C-RADS recommendations

RESULTS:

- The ontology used in the reporting process currently consists of 1794 Anatomy terms and 21,821 Pathology (i.e., Diagnosis) terms.
- A total of 1387 CDEs have been implemented in the system to date.
- CDE sources include the RSNA's RadElement repository, American College of Radiology's RADS reporting systems, and the College of American Pathologists' Cancer Protocol Templates.
- The principles of inheritance and transference of CDE properties provide for an efficient way to manage and maintain the ever-growing CDE library.

CDEs may originate from multiple sources as in this case for rectal cancer staging

CONCLUSIONS:

- Common data elements are an essential component of radiology reporting and data science initiatives.
- A practical and efficient method for implementing CDEs in an interactive multimedia reporting environment has been demonstrated.