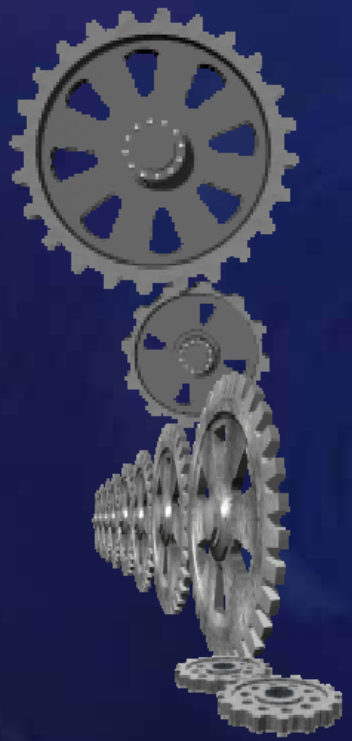
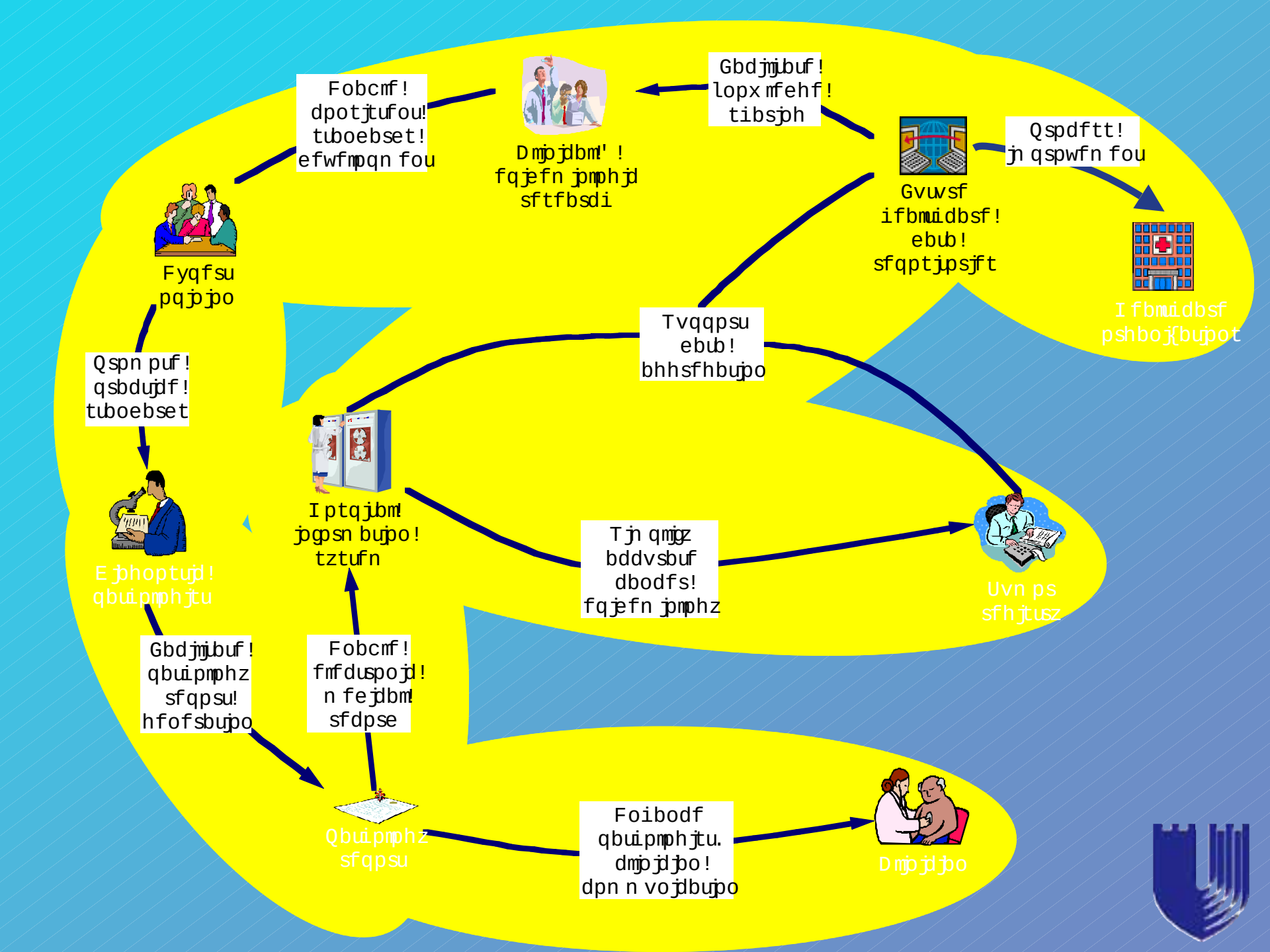
Standard terminology in pathology reporting, storage and retrieval

Next-generation systems
at Duke University

Anatomic pathology reporting: a complex process



- Reporting standards
- Customizability
- Many data consumers with varied requirements
- Retrievability


Fobcmf!
dpotjtufou!
tuboebset!
efwfmpqn fou
Dmjojdbm!' !
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Gbdjmjubuf!
lopx mfehf!
tibsjoh
Gvuvsf
ifbmuidbsf!
ebub!
sfqptjupsjft
Qspdftt!
jn qspwfn fou
Ifbmuidbsf
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Fyqfsu
pqjojpo
Tvqqpsu
ebub!
bhhsfhbujpo
Qspn puf!
qsbdujdf!
tuboebset
Iptqjubm!
jogpsn bujpo!
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Tjn qmjgz
bddvsbuf
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Fobcmf!
fmfduspojd!
n fejdbm!
sfdpse
Qbuipmphz
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Foibodf
qbuipmphjtu.
dmjojdjpo!
dpn n vojdbujpo
Dmjojdjpo

Next generation systems at Duke University

- “Medical Assistant on the World Wide Web” (MAW3™)
- Standardized Cancer Reporting System

Medical Assistant on the World Wide Web (MAW3™)

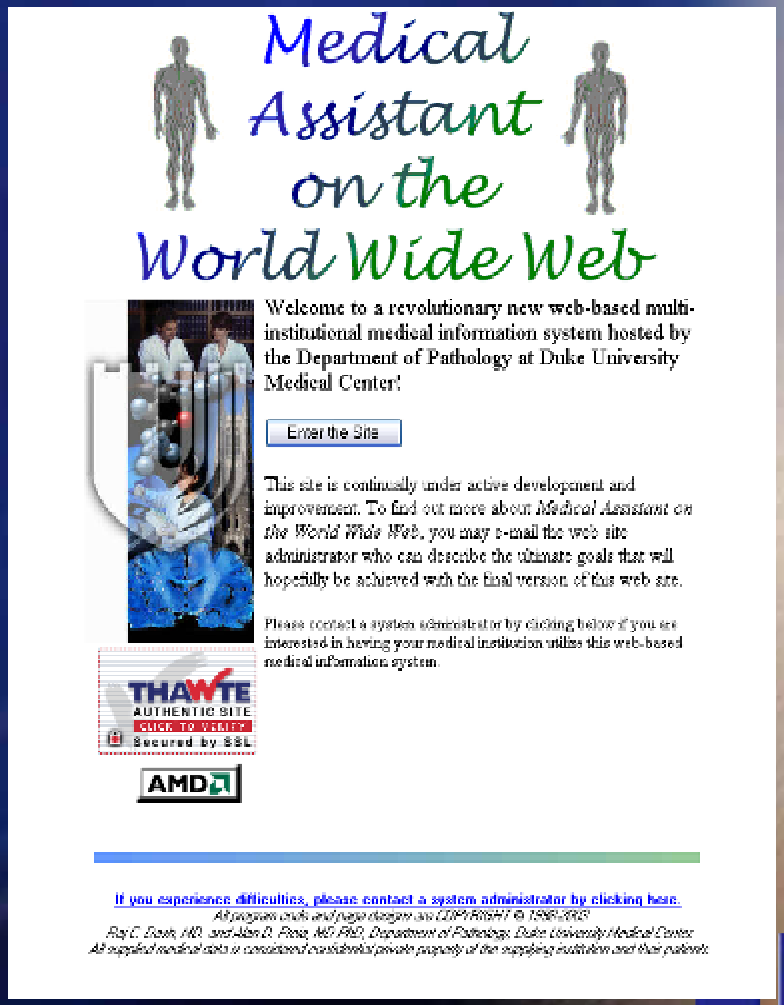
- Prototype for a centralized, multi-institutional medical database
- Addresses need for a centralized electronic medical record (EMR)

  Currently serves as Autopsy IS at Duke
- Security is critical
- SNOMED CT encodes all data elements

MAW3 Key Components

- Data entry
- Data storage
- Data reporting
- Very flexible: multiple data paradigms
- Underlying unifying factor: **SNOMED CT**

  Common terminology in which all data is encoded, stored, and referenced



Current User: Raj Dash (Attending, Administrator, Director) at Duke University Medical Center, Durham, NC

Connection: web server prancer, data s

Current Topic: ATEST-11-01 - Autopsy Report - Cardiovascular System - Heart

Autopsy	Coronary artery	Normal

External Examination

Protection

External Findings

Upon external examination, the epicardium is smooth, glistening and unremarkable. There is a moderate amount of epicardial fat present. The aorta, pulmonary artery,

without stenosis. The coronary circulation is right dominant. TTP 3

Right Coronary Artery

The coronary artery has no atherosclerosis. There are no occlusive thromb

Left Main Coronary Artery

The coronary artery has no atherosclerosis. There are no occlusive thromb

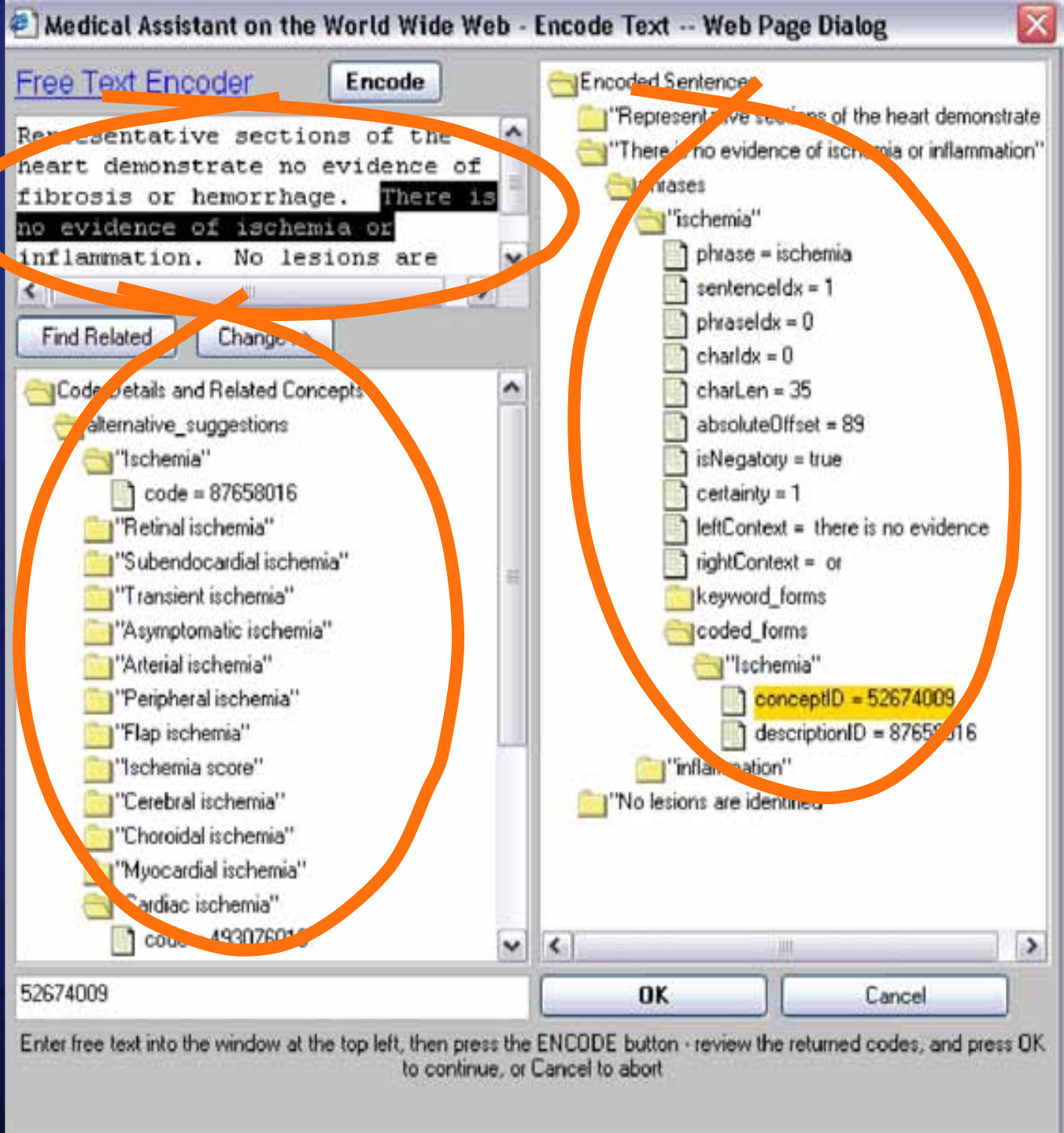
abnormalities. A normal distribution of red and white pulp is present. No cy

Circumflex Branch

The coronary artery has no atherosclerosis. There are no occlusive thromb

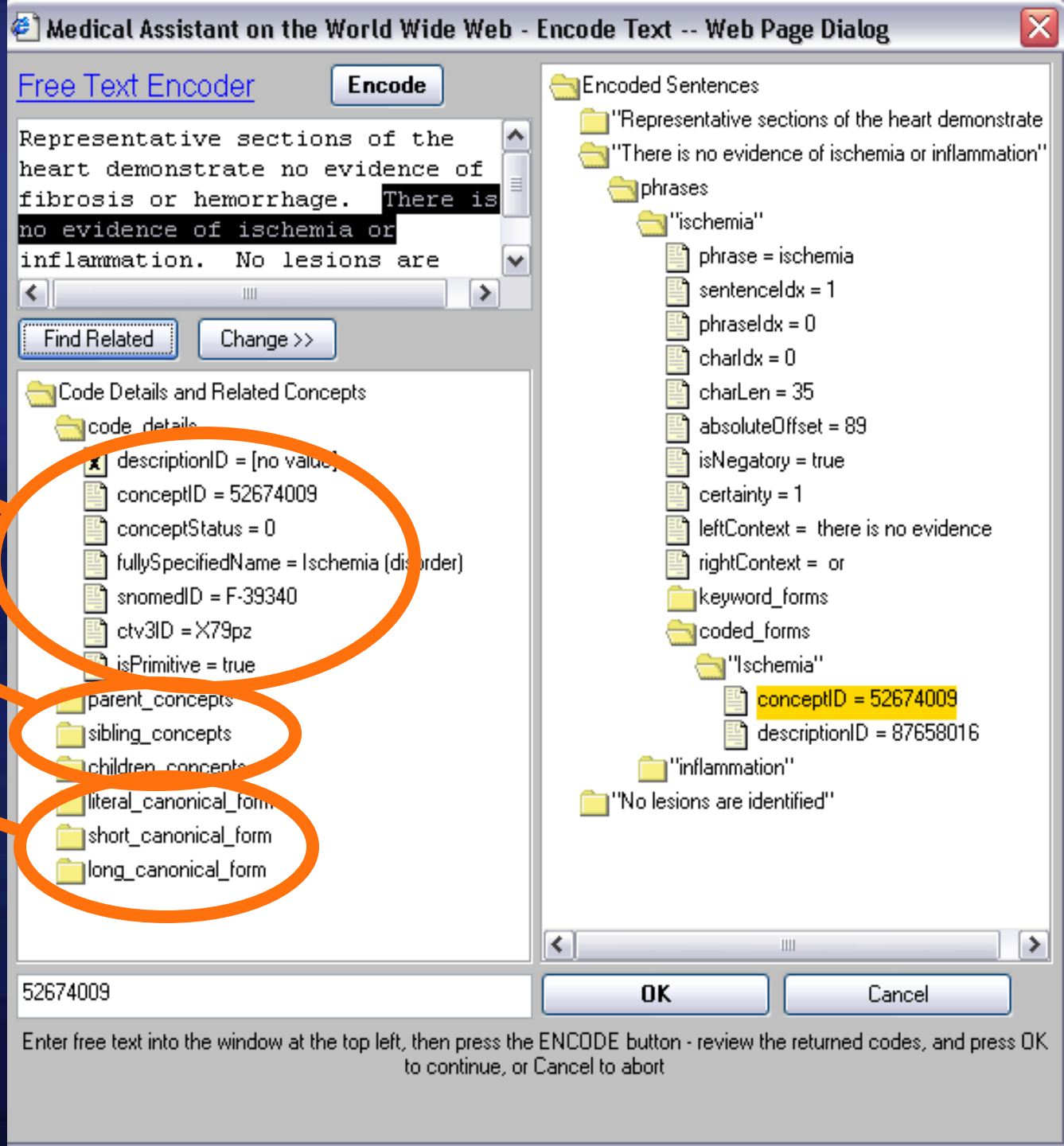
Encoding Free Text using SNOMED CT

- Link from source text to encoded representation
- Natural language processor
- Related term browser



Encoding Free Text using SNOMED CT

- Identify SNOMED CT code meaning
- Browse Hierarchy
- View canonical forms



College of American Pathologists
Cancer Reporting Protocols

- Specifies of required data elements in cancer reports
- ≥90% compliance for ACoS Cancer Center accreditation (begins 2004)
- Over 30 site-specific protocols with complex, cascading requirements
- SNOMED CT encodings developed in cooperation with CAP Cancer Committee

Colon and rectum

CAP.COLO

CARCINOMA OF COLON/RECTUM (*SPECIFY*):

Histologic type
TYPE□co
- [1] ○ Adenocarcinoma
- [2] ○ Mucinous adenocarcinoma
- [3] ○ Signet ring cell carcinoma
- [4] ○ Undifferentiated carcinoma
- [5] ○ Other (*specify*: _____)
- [X] ○ Cannot be determined

Histologic grade
GRADE□co
- [1] ○ Low grade
- [2] ○ High grade
- [X] ○ Cannot be determined

Extent of invasion
INVA□co
- [S] ○ Intramucosal carcinoma
  - [SA] ○ Lamina propria invasion only
  - [SB] ○ Into (not through) muscularis mucosae only
- [1] ○ Submucosa
- [2] ○ Into (not through) muscularis propria
- [3] ○ Through muscularis propria into subserosa/pericolic tissue
  - [3A] ○ ≤5 mm into subserosa/pericolic tissue
  - [3B] ○ >5 mm into subserosa/pericolic tissue
- [4] ○ Invades other structures or peritoneal cavity
  - [4A] ○ Directly invades extracolic organs/structures (*specify*)
  - [4B] ○ Perforates visceral peritoneum

Margin

Proximal: ..... ○Negative ..... ○Positive ..... ○Indeterminate

Distal: ..... ○Negative ..... ○Positive ..... ○Indeterminate

Radial (deep): ..... ○Negative ..... ○Positive ..... ○Indeterminate

Closest margin: _____, ____ CM

Vascular (small vessel) invasion: ..... ○Negative ..... ○Positive ..... ○Indeterminate

Vascular (large venous) invasion: ..... ○Negative ..... ○Positive ..... ○Indeterminate

Perineural invasion: ..... ○Negative ..... ○Positive ..... ○Indeterminate

Tumor border configuration: ..... ○Pushing (smooth) ..... ○Infiltrating (ragged)

Peritumoral lymphocytic response: .....
- [3] ○ None
- [1] ○ Mild to moderate
- [2] ○ Marked ("Crohn's-like response")

Associated adenoma(s): ..... ○Absent ..... ○Present (*specify*: _____)

Appendix: ..... ○No pathologic diagnosis ..... ○Other (*specify*: _____)

Regional lymph nodes .....
NODES□co
- [N] ○ Negative for carcinoma, _____ lymph nodes examined
- [P] ○ Metastatic malignancy in _____ of _____ lymph nodes
  (*For solitary metastatic focus ≤ 2 mm, include explanatory note*)
- [S] ○ Lymph nodes reported separately
- [X] ○ No lymph nodes recovered

Additional findings: _____

_____

Cancer Reporting System
Software layers

- Data entry module
  - Web server pages
- Relational database backend
  - SNOMED CT encoding
  - Item logic
- Visual template construction environment

CAP Cancer Protocol Checklists

Select template

- Abdominoperineal resection
- Other

Length

Histologic type

- Adenocarcinoma
- Mucinous adenocarcinoma
- Signet ring cell carcinoma
- Undifferentiated carcinoma
- Other
- Cannot be determined

Breast

Colon/Rectum

Lung

Pancreas

Test

Histologic grade

- Low grade
- High grade (greater than or equal to 50% gland formation)
- Cannot be determined
- Not applicable

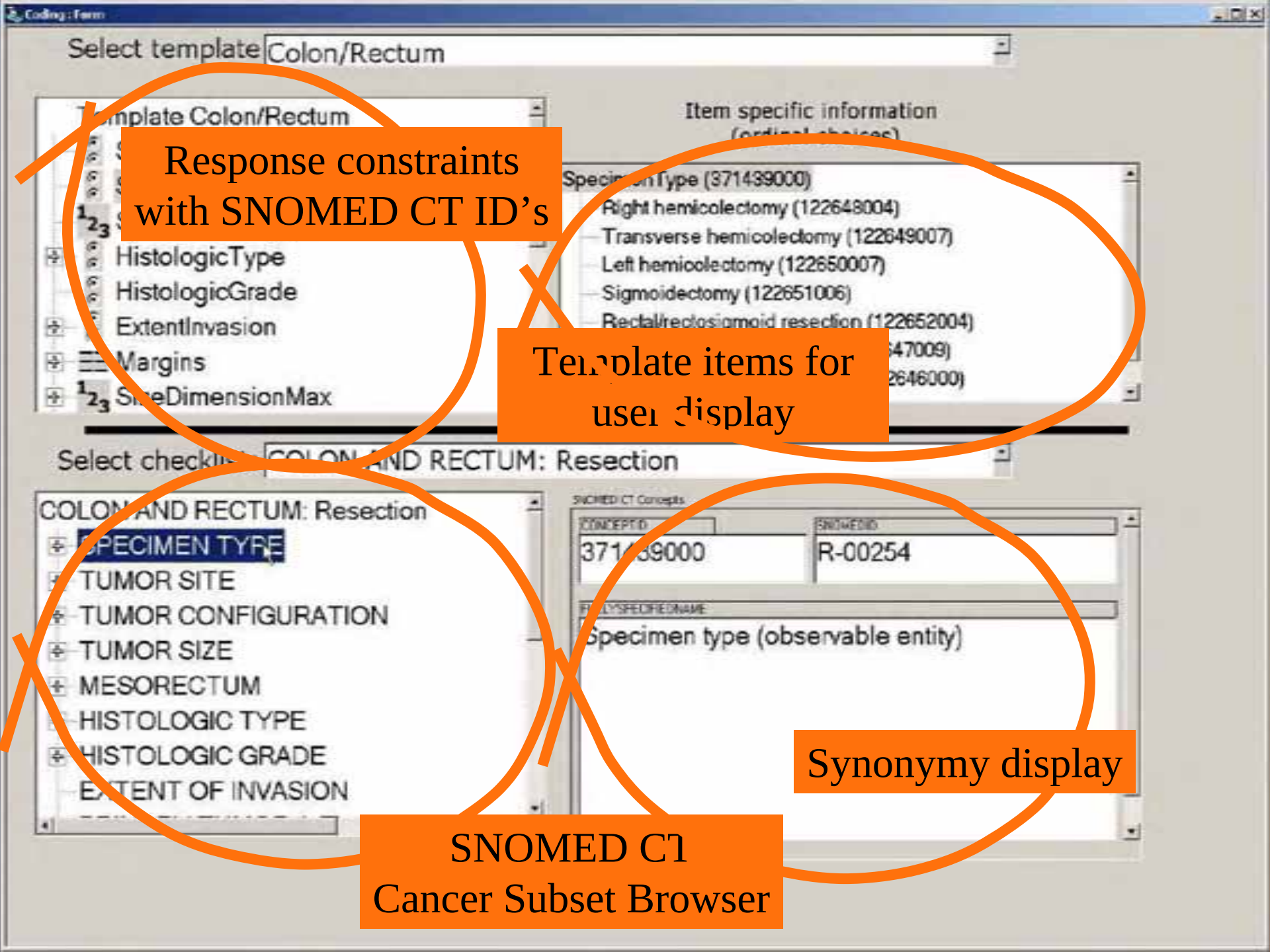
Extent of invasion

- Intramucosal carcinoma
- Submucosa
- Into (not through) muscularis propria
- Through muscularis propria into subserosa/pericolic tissue
- Invades other structures or peritoneal cavity

Margins

Cancer Reporting System
User Input

- Simple, visual interface
  - Checkboxes, dropdown lists, etc.
  - Error & type checking
  - Context dependent constraints, hide/show, computed outputs
- Hyperlinks to protocols, tooltip help
- Platform independent (web-based)


Select template
Colon/Rectum
Item specific information
HistologicType
HistologicGrade
ExtentInvasion
Margins
Right hemicolectomy (122648004)
Transverse hemicolectomy (122649007)
Left hemicolectomy (122650007)
Sigmoidectomy (122651006)
COLON AND RECTUM: Resection
SPECIMEN TYPE
TUMOR SITE
TUMOR CONFIGURATION
TUMOR SIZE
MESORECTUM
HISTOLOGIC TYPE
HISTOLOGIC GRADE
EXTENT OF INVASION
R-00254
Specimen type (observable entity)
Response constraints with SNOMED CT ID's
Template items for user display
Synonymy display
SNOMED CT Cancer Subset Browser

Cancer Reporting System

Flexible output

- Same “input” template can have many different output representations
  - TXT, RTF
  - XML, including CDA Level 1 wrapper
  - CDA Level 2 on the way…

XML output with SNOMED CT codes

```
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    <CAP:Choice Name="Cecum" Text="Cecum" Ordinal="1" ChoiceID="1407">
        <CAP:Codes>
            <CAP:Code Terminology="SNOMED CT" Value="32713005"/>
        </CAP:Codes>
    </CAP:Choice>
    <CAP:Choice Name="Right (ascending) colon" Text="Right (ascending) colon" Ordinal="2" ChoiceID="1408">
        <CAP:Codes>
            <CAP:Code Terminology="SNOMED CT" Value="9040008"/>
        </CAP:Codes>
    </CAP:Choice>
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        <CAP:Codes>
            <CAP:Code Terminology="SNOMED CT" Value="48338005"/>
        </CAP:Codes>
    </CAP:Choice>
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        <CAP:Codes>
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    </CAP:Choice>
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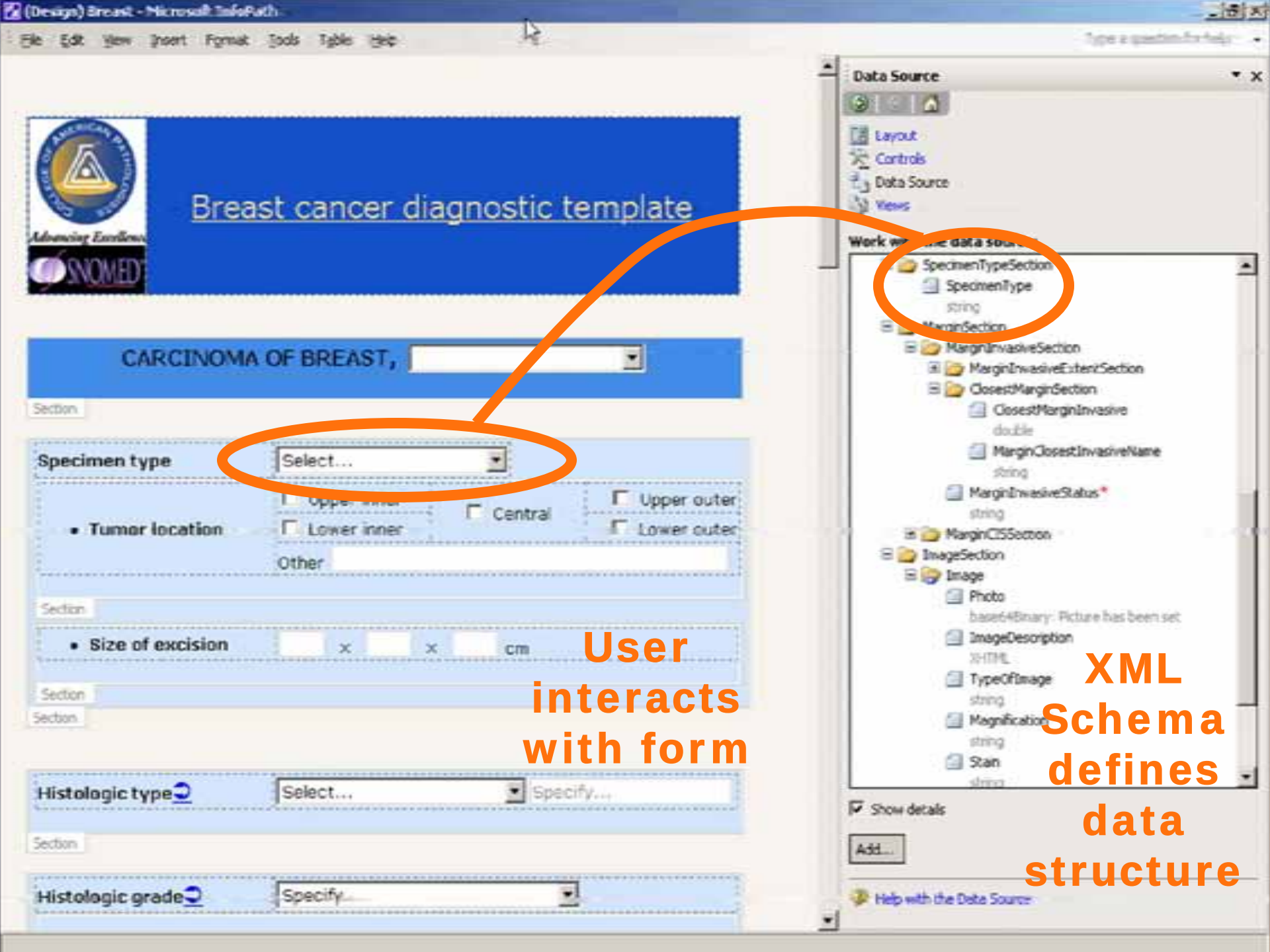
Breast cancer diagnostic template
CARCINOMA OF BREAST,
Specimen type
Select...
Tumor location
Upper outer
Central
Lower inner
Lower outer
Other
Size of excision
cm
Histologic type
Select...
Specify...
Histologic grade
Specify...
Data Source
Layout
Controls
Data Source
Views
SpecimenTypeSection
SpecimenType
string
MarginInvasiveSection
ClosestMarginSection
ClosestMarginInvasive
double
MarginClosestInvasiveName
MarginInvasiveStatus*
ImageSection
Image
Photo
ImageDescription
TypeOfImage
Stain
Show details
Add...
Help with the Data Source
User interacts with form
XML Schema defines data structure

Key terminologic synergies

- Standard vocabulary (e.g. SNOMED CT)
  - Rich internal relationships
  - Can constitute new relationships (post-coordinations, compositions)
- Templates (e.g. CAP Cancer Specs)
  - Reusable context to capture stereotypical healthcare scenarios
- Structured documents (e.g HL7 CDA)
  - Allow encodings to address natural-language assertions at high granularity