

ACRASSIST

Imaging 3.0 Informatics Initiatives

ACR 2017

WASHINGTON, DC

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WHY CDS FOR REPORTING

ACRAssist

IMAGING 3.0: RADIOLOGY REPORTING

- INFORMATION QUALITY (IQ)
 - THE QUALITY OF THE CONTENT WITHIN AN INFORMATION SYSTEM
 - NOT JUST ACCURACY – COMPLETENESS, CONFORMITY, USABILITY, CONSISTENCY, DUPLICATION, INTEGRITY
 - POOR REPORT IQ IS DIFFICULT TO MEASURE BUT EASY TO SEE
 - ‘I KNOW IT WHEN I SEE IT’¹
 - WHAT WOULD A SYSTEM THAT IMPROVES REPORT IQ LOOK LIKE?
 - IT WOULD NEED TO ASSIST THE RADIOLOGIST WITH:
 - DETECTION OF FINDINGS
 - INTERPRETATION/CLASSIFICATION OF DISEASE
 - RECOMMENDATION OF ACTIONS
 - COMMUNICATION OF ALL THE ABOVE

1 POTTER STEWART, SCJ, JACOBELLIS V. OHIO, DETERMINATION OF ‘PORNOGRAPHY’

IMAGING 3.0: RADIOLOGY REPORTING



ACR BI-RADS® Atlas Fifth Edition

QUICK REFERENCE



MAMMOGRAPHY		ULTRASOUND		MAGNETIC RESONANCE IMAGING			
Breast composition	a. The breasts are almost entirely fatty b. There are scattered areas of fibroglandular density c. The breasts are heterogeneously dense, which may obscure small masses d. The breasts are extremely dense, which lowers the sensitivity of mammography	Tissue composition (screening only)	a. Homogeneous background echotexture – fat b. Homogeneous background echotexture – fibroglandular c. Heterogeneous background echotexture	Amount of fibroglandular tissue (FGT)	a. Almost entirely fat b. Scattered fibroglandular tissue c. Heterogeneous fibroglandular tissue d. Extreme fibroglandular tissue	Associated features	Nipple retraction
Masses	Shape : Oval : Round : Irregular Margin : Circumscribed : Obscured : Microlobulated : Indistinct : Spiculated Density : High density : Equal density : Low density : Fat-containing	Masses	Shape : Oval : Round : Irregular Orientation : Parallel : Not parallel Margin : Circumscribed : Not circumscribed : Indistinct : Angular : Microlobulated : Spiculated Echo pattern : Anechoic : Hyperechoic : Complex cystic and solid : Hypoechoic : Isoechoic : Heterogeneous Posterior features : No posterior features : Enhancement : Shadowing : Combined pattern	Background parenchymal enhancement (BPE)	Level : Minimal : Mild : Moderate : Marked Symmetric or asymmetric : Symmetric : Asymmetric	Nipple invasion : Skin retraction : Skin thickening : Skin invasion : Direct invasion : Inflammatory cancer Axillary adenopathy : Pectoralis muscle invasion : Chest wall invasion : Architectural distortion	
Calcifications	Typically benign : Skin : Vascular : Coarse or "popcorn-like" : Large rod-like : Round : Rim : Dystrophic : Milk of calcium : Suture Suspicious morphology : Amorphous : Coarse heterogeneous : Fine pleomorphic : Fine linear or fine-linear branching Distribution : Diffuse : Regional : Grouped : Linear : Segmental	Calcifications : Calcifications in a mass : Calcifications outside of a mass : Intraductal calcifications : Architectural distortion : Duct changes : Skin changes : Skin thickening : Skin retraction Edema : Vascularity : Absent : Internal vascularity : Vessels in rim Elasticity assessment : Soft : Intermediate : Hard	Focus	Masses	Shape : Oval : Round : Irregular Margin : Circumscribed : Not circumscribed : Irregular : Spiculated Internal enhancement characteristics : Homogeneous : Heterogeneous : Rim enhancement : Dark internal septations	fat containing lesions : Lymph nodes : Normal : Abnormal : Fat necrosis : Hematoma : Postoperative seroma/hematoma with fat Location : Depth : Kinetic curve assessment : Signal intensity (SI)/time curve description	Initial phase : Slow : Medium : Fast Delayed phase : Persistent : Plateau : Washout
Architectural distortion		Associated features : Duct changes : Skin changes : Skin thickening : Skin retraction Edema : Vascularity : Absent : Internal vascularity : Vessels in rim Elasticity assessment : Soft : Intermediate : Hard	Non-mass enhancement (NME)	Distribution : Focal : Linear : Segmental : Regional : Multiple regions : Diffuse Internal enhancement patterns : Homogeneous : Heterogeneous : Clumped : Clustered ring	Implants	Implant material and lumen type : Saline : Silicone : - Intact : - Ruptured : Other implant material : Lumen type Implant location : Retroglanular : Retropectoral Abnormal implant contour : Focal bulge Intracapsular silicone findings : Radial fold : Subcapsular line : Keyhole sign (beardlip, nose) : Linguine sign	
Asymmetries	: Asymmetry : Global asymmetry : Focal asymmetry : Developing asymmetry	Special cases : Simple cyst : Clustered microcysts : Complicated cyst : Mass in or on skin : Foreign body including implants : Lymph nodes – Intramammary : Lymph nodes – axillary : Vascular abnormalities : AVMs (arteriovenous malformations/pseudoaneurysms) : Mondor disease : Postsurgical fluid collection : Fat necrosis	Intramammary lymph node	Non-enhancing findings : Ductal precontrast high signal on T1W : Cyst : Postoperative collections (hematoma/seroma) : Post-therapy skin thickening and trabecular thickening : Non-enhancing mass : Architectural distortion : Signal void from foreign bodies, clips, etc.	Extencapsular silicone : Breast : Lymph nodes Water droplets : PerImplant fluid		
Intramammary lymph node			Non-enhancing findings				
Skin lesion							
Solitary dilated duct							
Associated features	: Skin retraction : Nipple retraction : Skin thickening : Skin retraction : Skin thickening : Trabecular thickening : Axillary adenopathy : Architectural distortion : Calcifications						
Location of lesion	: Laterality : Quadrant and clock face : Depth : Distance from the nipple						

BI-RADS® ASSESSMENT CATEGORIES	
Category 0: Mammography: Incomplete – Need Additional Imaging Evaluation and/or Prior Mammograms for Comparison Ultrasound & MRI: Incomplete – Need Additional Imaging Evaluation	
Category 1: Negative	
Category 2: Benign	
Category 3: Probably Benign	
Category 4: Suspicious	Category 4A: Low suspicion for malignancy Category 4B: Moderate suspicion for malignancy Category 4C: High suspicion for malignancy
Category 5: Highly Suggestive of Malignancy	
Category 6: Known Biopsy-Proven Malignancy	

For the complete Atlas, visit acr.org/birads

IMAGING 3.0: RADIOLOGY REPORTING

• IN

BI-RADS®		
Category 0: Mammography: Incomplete – Need Additional Imaging Evaluation and/or Prior Mammograms for Comparison Ultrasound & MRI: Incomplete – Need Additional Imaging Evaluation		
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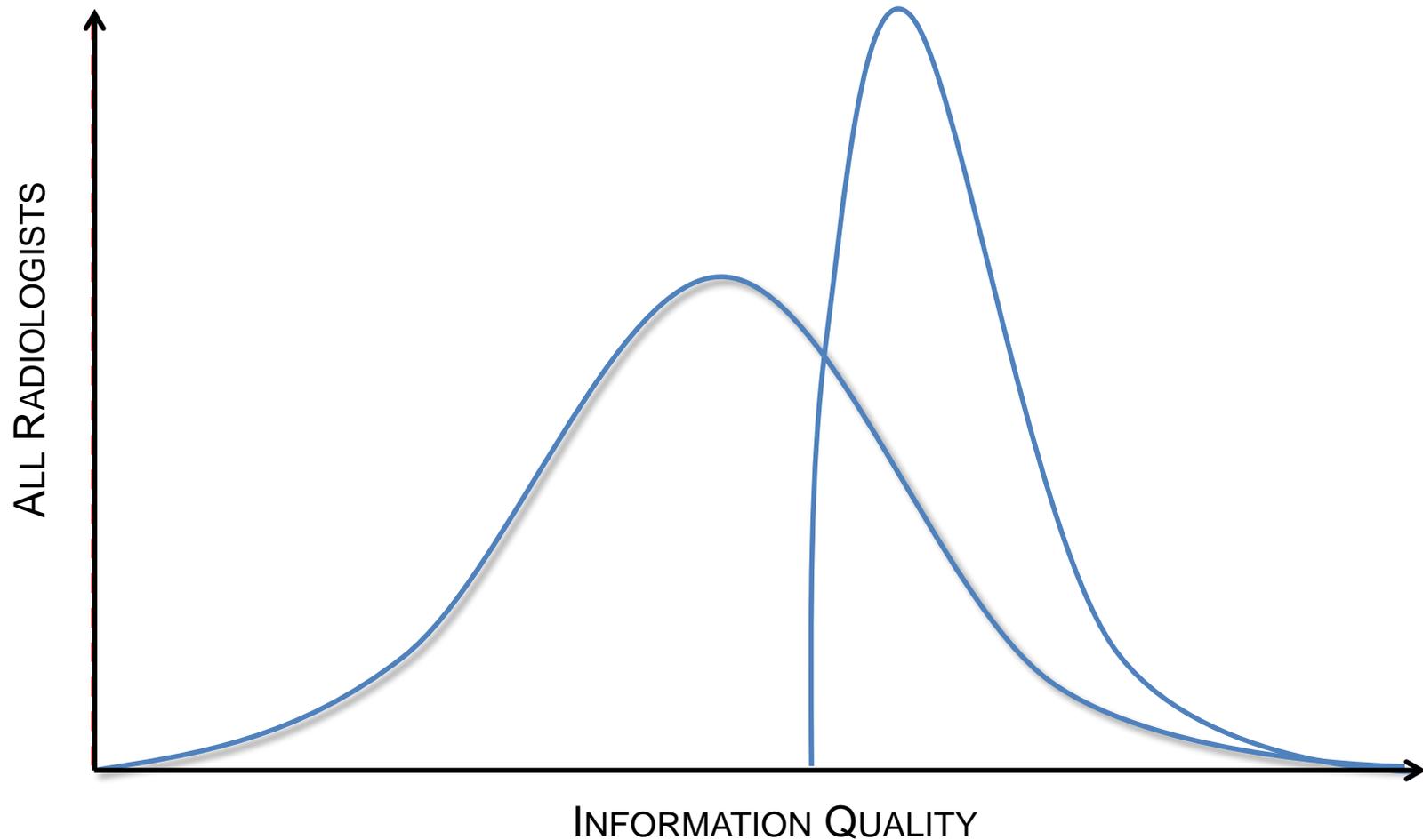
• IT WOULD NEED TO ASSIST THE RADIOLOGIST WITH.

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IMAGING 3.0: EFFECT OF BI-RADS ON IQ

CREATES A QUALITY THRESHOLD



IMAGING 3.0: RADIOLOGY REPORTING

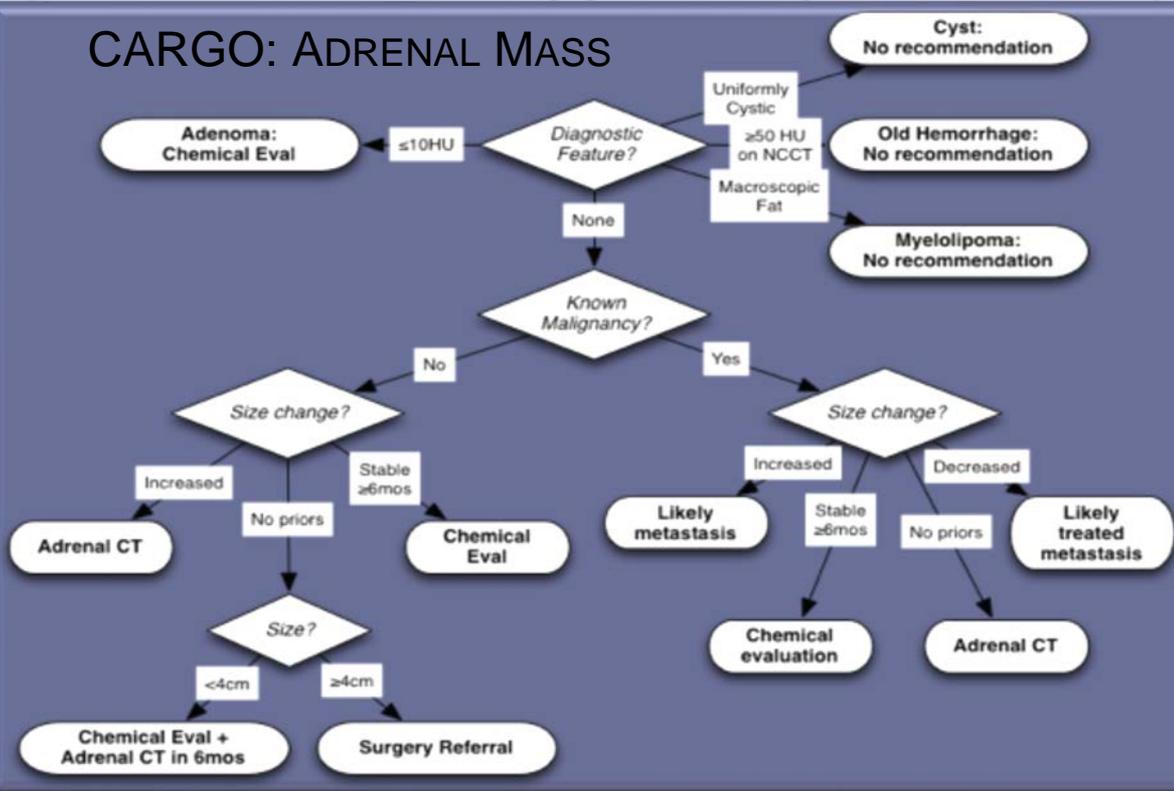
- RADS

- **ACR INCIDENTOMA WHITE PAPERS**

- **COMPUTER ASSISTED REPORTING GUIDANCE OBJECTS (CARGO)**

- Berland, Lincoln L. et al. *Managing Incidental Findings on Abdominal CT: White Paper of the ACR Incidental Findings Committee.*

CARGO: ADRENAL MASS



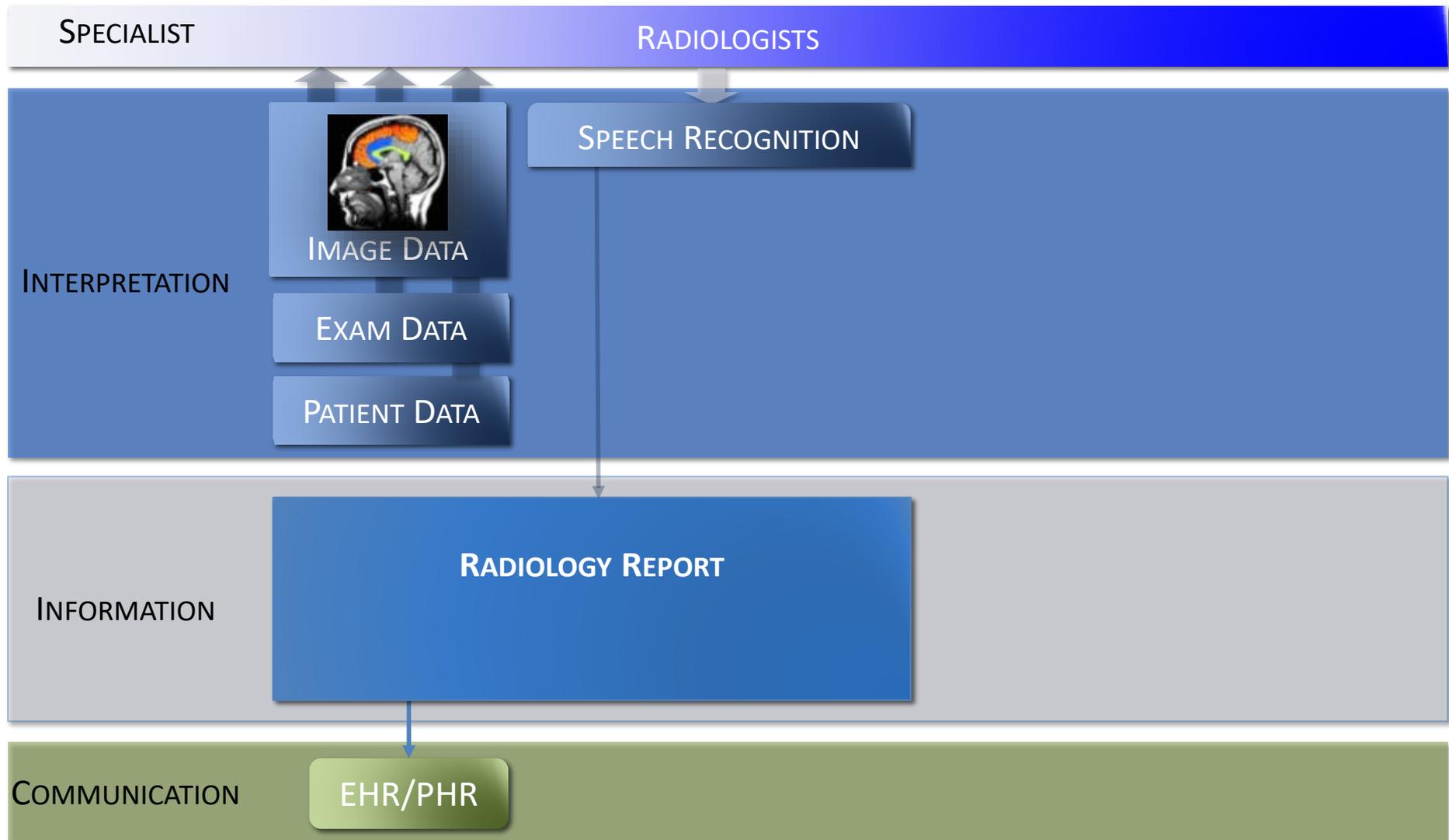
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      <choice name="right_side">right</choice>
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      <synonym>fluid density</synonym>
      <synonym>simple cyst</synonym>
    </feature>
    <feature name="density" type="numeric"/>
    <feature name="macroscopic_fat" type="present_absent" default="absent">
      <synonym>fat density</synonym>
    </feature>
  </features>

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    </if>
    <if feature="hypodense" value="present">
      <if feature="stable" value="present">
        <end_point ref="hypodense_stable"/>
      </if>
    </if>
    <else>
      <end_point ref="hypodense_no_priors"/>
    </else>
  </if>
  <if feature="macroscopic_fat" value="present">
    <end_point ref="macroscopic_fat"/>
  </if>
  <if feature="old_hemorrhage" value="present">
    <end_point ref="old_hemorrhage"/>
  </if>

  <end_points>
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      <impression>{{size}} mm module in the {{side}} adrenal gland, similar to prior. Radiologic findings are most consistent with a benign adrenal adenoma.</impression>
      <recommendations>As adrenal adenomas may be hormonally active with subclin suggest further evaluation for endocrine hyperfunction for most patients. Grumbach MM et al. (2003) "Management of the clinically inapparent adrenal ("incidentaloma")." Ann Int Med 138:424-429 and young, w. (2007) "The inc discovered adrenal mass." New Engl J Med 356:601-610.</recommendations>
    </end_point>
    <end_point id="hypodense_no_priors">
      <body>A {{size}} mm module in the {{side}} adrenal gland, similar to prior. Radiologic findings are most consistent with a benign adrenal adenoma.</body>
      <impression>{{size}} mm module in the {{side}} adrenal gland, similar to prior. Radiologic findings are most consistent with a benign adrenal adenoma.</impression>
      <recommendations>As adrenal adenomas may be hormonally active with subclin suggest further evaluation for endocrine hyperfunction for most patients. Grumbach MM et al. (2003) "Management of the clinically inapparent adrenal ("incidentaloma")." Ann Int Med 138:424-429 and young, w. (2007) "The inc discovered adrenal mass." New Engl J Med 356:601-610.</recommendations>
    </end_point>
  </end_points>
</algorithm>
  
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STANDARD RADIOLOGY REPORTING



RADIOLOGY REPORTING WITH BI-RADS

SPECIALIST

RADIOLOGISTS



IMAGE DATA

EXAM DATA

PATIENT DATA

SPEECH RECOGNITION

ACR BI-RADS CLASSIFICATION



INFORMATION

RADIOLOGY REPORT
NARRATIVE COMPONENT
STRUCTURED COMPONENT

- Category 1: Negative
- Category 2: Benign
- Category 3: Probably Benign
- Category 4: Suspicious
- Category 5: Highly Suggestive of Malignancy
- Category 6: Known Biopsy-Proven Malignancy

Mammography & Ultrasound

COMMUNICATION

EHR/PHR

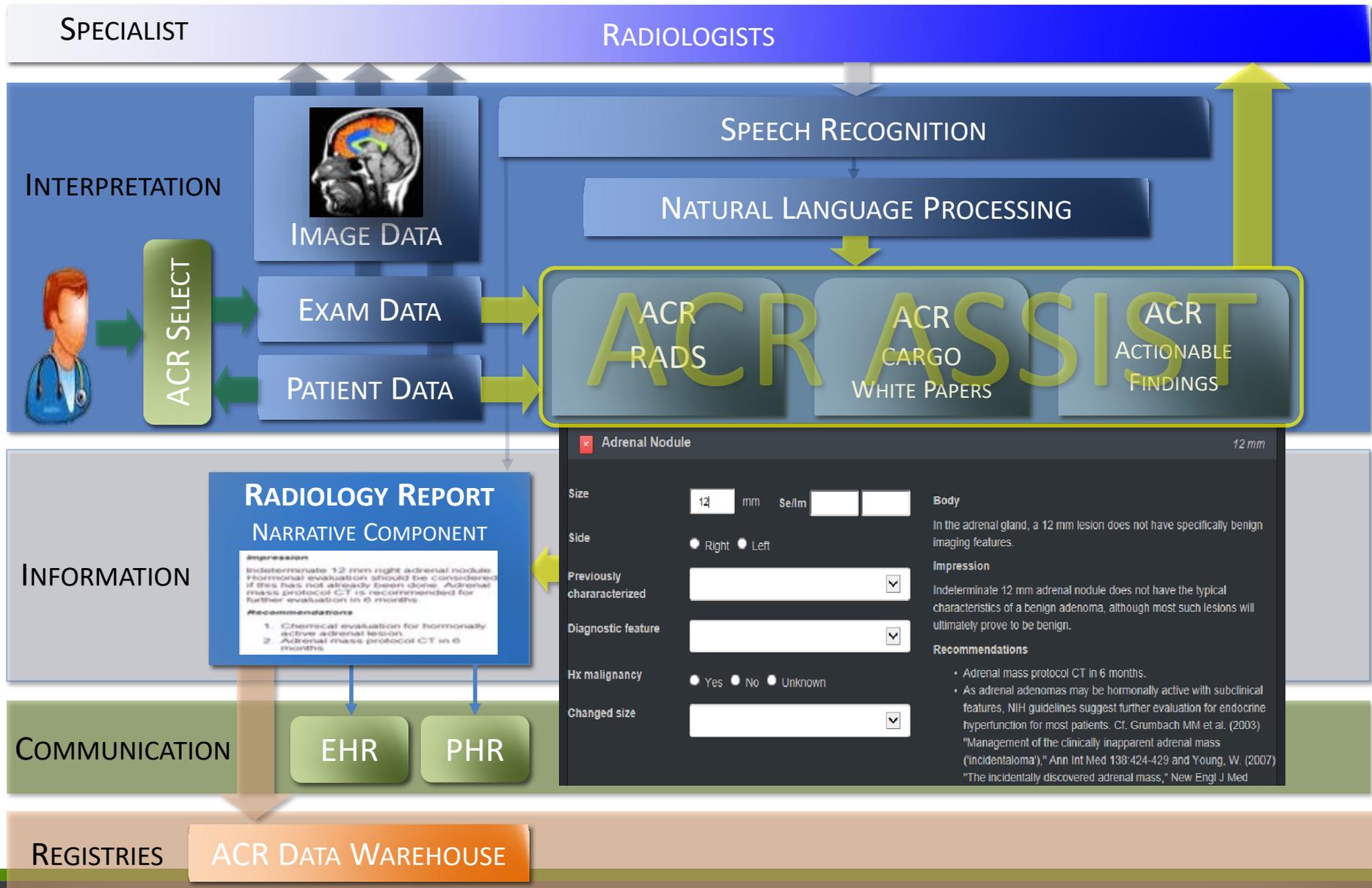
CRITICAL RESULT MANAGEMENT SYSTEM

REGISTRIES

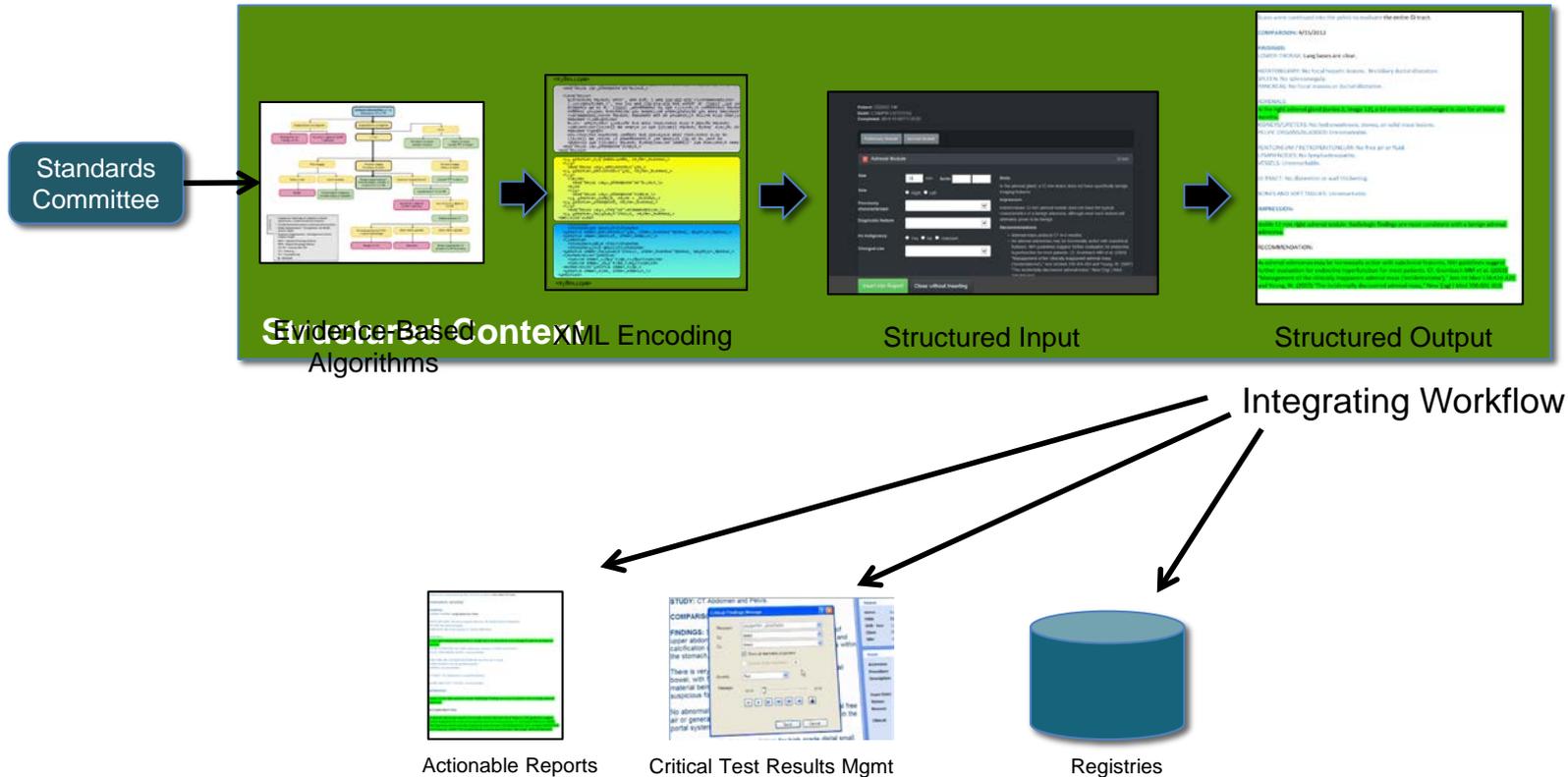
ACR NATIONAL MAMMOGRAPHY DATABASE

INTERPRETATION

RADIOLOGY REPORTING WITH ACR ASSIST



Radiology Decision Support Framework



WHAT IS ACROSSIST

What does ACR Assist Project consist of?

Open CAR/DS Framework: a definition of how to encode guidelines and how reporting systems should implement these encoded guidelines in their tools

Vendor Implementations: Vendors build the ability to use ACR Assist-encoded guidelines as “plug-ins” within their products

ACR Assist Product: encoded guidelines based on existing and new ACR practice guidelines and standards which have been officially reviewed and “blessed” by appropriate ACR committees/working groups.

Third-party Content: Other sub-specialty societies, academic medical centers, solo developers create compliant guidelines which can then be run on the vendor implementations

Open CAR/DS Framework

Previously: Computer Assisted Reporting/Decision Support

*Now: Computer Assisted Reporting/**Data Sciences***

- **Schema:** the format the guidelines are written in
- **MARVAL:** Review tool to review and validate encoding
- **Simulator:** Tool to view/interact with encoded guidelines
- **Documentation and Access**
 - White paper in JACR
 - Technical documentation, schema, and Code available on Github
 - Tutorial on how to encode a guideline

All being made freely available, promoted via ACR website

File Edit View Insert Format Tools Speech Help

Close Wet Read Draft Correct Reject Prelim Sign Normal Discard PACS AutoText New... B I U Abc Content Wizard... 00:00 - 00:00

Fields (4)
Comparison
Findings
Impression
Citation

Report - UNKNOWN, - temp

COMPARISON: []
FINDINGS: []
IMPRESSION: []
CITATION: []

Order Data

Enter Findings Mode

Properties
Fields (4)
Notes
Attachments

Clinical Guidance (10)

User: Tarik K Alkasab Drafts: 1 Attending Disconnected

File Edit View Insert Format Tools Speech Help

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Fields (4)

- Comparison
- Findings
- Impression
- Citation

Report - UNKNOWN, - temp

COMPARISON: []

FINDINGS: []

IMPRESSION: []

CITATION: []

Clinical Guidance (10)

Show relevant guidance only

Guidance	Description	Modality	Age	Gender	Attachments
Adnexal Cyst US	Asymptomatic cystic lesions seen in the adnexa on ultrasound.	US	19+	Female	
Adrenal Nodule	Discrete lesion within either adrenal gland measuring at least 10 mm that has not been previously characterized.	CT	19+	Both	
Hepatic Trauma Grading	Grading of blunt hepatic trauma according to AAST liver injury scale.	CT	0+	Both	
Liver Lesion	Hepatic lesion seen incidentally on CT.	CT	19+	Both	
Lung Cancer Staging	IASLC staging system for lung cancer.	CT	19+	Both	IASLC staging system for lu...
Adnexal Mass	Incidental cystic adnexal mass seen on CT.	CT	18+	Female	
Renal Lesion	Incidental renal mass detected on CT.	CT	19+	Both	
Lung-RADS Cancer Screening	Lung-RADS-based cancer screening on CT	CT	19+	Both	
Pulmonary Nodule	Solitary pulmonary nodule seen incidentally on chest CT.	CT	35+	Both	
Thyroid Nodule	Thyroid nodule incidentally detected on CT or MRI.	CT	19+	Both	

User: Tarik K Alkasab Drafts: 1 Attending Disconnected

File Edit View Insert Format Tools Speech Help

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Fields (4)

- Comparison
- Findings
- Impression
- Citation

Enter Findings Mode

Properties

Fields (4)

Notes

Attachments

Report - UNKNOWN, - temp

COMPARISON: []

FINDINGS: []

IMPRESSION: []

CITATION: []

Guidance: Lung Cancer Staging

Include: Findings, Impression | Insert Remove

♦ Tumor Size (cm):	<input type="text"/>
♦ Tumor Location:	<input type="text"/>
⚠ Tumor status:	Unknown
⚠ Separate nodule(s)/mass(es):	No
⚠ Atelectasis/obstructive pneumonitis:	No
Tumor contact/abuts:	<input type="text"/>
Local invasion:	<input type="text"/>
⚠ Endobronchial involvement:	No
Intrathoracic metastasis:	<input type="text"/>
⚠ Extra-thoracic metastasis:	Unknown
Lymph nodes:	<input type="text"/>
⚠ Report Stage:	No
T-stage:	Specify tumor size
M-stage:	Mx
N-stage:	N0
Overall stage:	

The Clinical Guidance tool represents a translation of general information from literature sources into a computerized system, which cannot always be accomplished precisely, nor kept up-to-date continuously. Its application to any specific case should inform, not replace, the knowledge and judgment of the radiologist, who should adjust the final text to the clinical scenario as needed.

Enter the following required fields in order to generate report text:

- Tumor Size (cm)
- Tumor Location

Order Data

Clinical Guidance (10) | User: Tarik K Alkasab | Drafts: 1 | Attending | Disconnected

File Edit View Insert Format Tools Speech Help

Close Wet Read Draft Correct Reject Prelim Sign Normal Discard PACS AutoText New... B I U Abo Wizard... 00:00 - 00:00

Fields (4)

- Comparison
- Findings
- Impression
- Citation

Enter Findings Mode

Properties

Fields (4)

Notes

Attachments

Report - UNKNOWN, - temp

COMPARISON: []

FINDINGS: []

IMPRESSION: []

CITATION: []

Guidance: Lung Cancer Staging

Include: Findings, Impression Insert Remove

Tumor Size (cm): 3

Tumor Location: RUL

Tumor status: Unknown

Separate nodule(s)/mass(es): Same lobe

Atelectasis/obstructive pneumonitis: No

Tumor contact/abuts:

Local invasion:

Endobronchial involvement:

Intrathoracic metastasis:

Extra-thoracic metastasis:

Lymph nodes:

Report Stage: No

T-stage: T3

M-stage: Mx

N-stage: N0

Overall stage: IIB

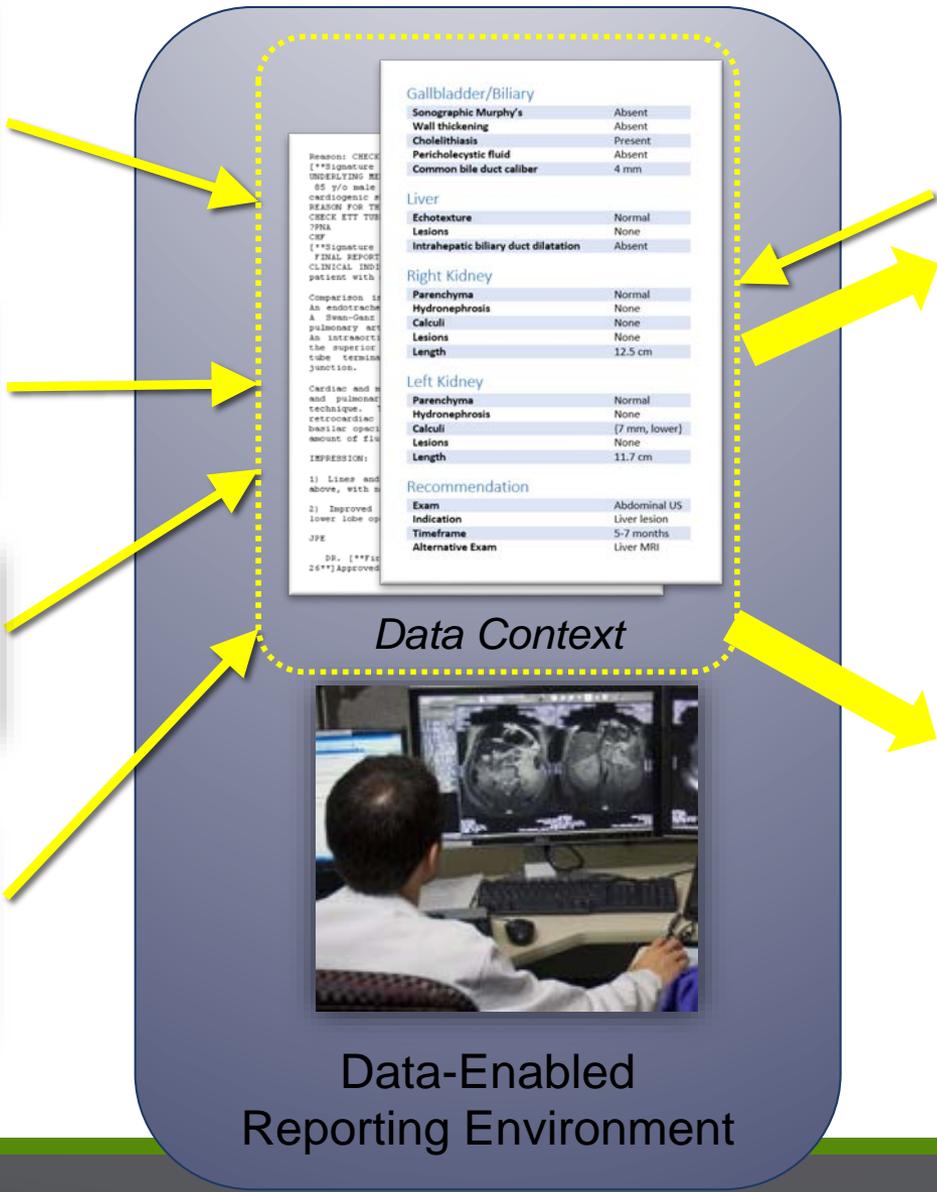
FINDINGS:
Pulmonary mass in the right upper lobe measures 3 cm. A separate nodule/mass is seen in the same lobe. No atelectasis/obstructive pneumonitis is seen. There is no imaging evidence of bronchial involvement or invasion of local structures. No enlarged lymph nodes are seen.

IMPRESSION:
Pulmonary mass in the right upper lobe measuring 3 cm is concerning for neoplasm. Histologic confirmation or short-term follow-up chest CT is recommended. Separate nodule/mass in the same lobe, which could represent either metastasis or a metachronous primary. No bronchial involvement is seen. Mass is surrounded by lung or visceral pleura. No enlarged lymph nodes are seen, though this does not exclude nodal disease. No imaging evidence of intrathoracic metastasis is seen.

Order Data

Clinical Guidance (10) | User: Tarik K Alkasab | Drafts: 1 | Attending | Disconnected

Next Generation Data-Enabled Reporting



Gallbladder/Biliary	
Sonographic Murphy's	Absent
Wall thickening	Absent
Cholelithiasis	Present
Pericholecystic fluid	Absent
Common bile duct caliber	4 mm

Liver	
Echotexture	Normal
Lesions	None
Intrahepatic biliary duct dilatation	Absent

Right Kidney	
Paranechyma	Normal
Hydronephrosis	None
Calculi	None
Lesions	None
Length	12.5 cm

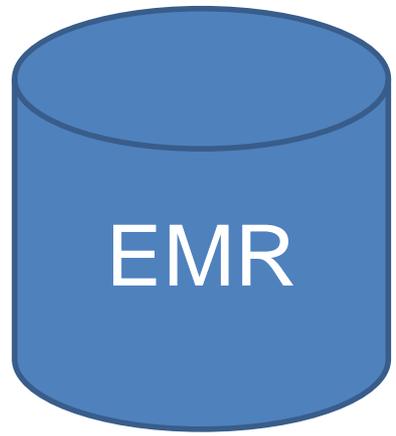
Left Kidney	
Paranechyma	Normal
Hydronephrosis	None
Calculi	(7 mm, lower)
Lesions	None
Length	11.7 cm

Recommendation	
Exam	Abdominal US
Indication	Liver lesion
Timeframe	5-7 months
Alternative Exam	Liver MRI

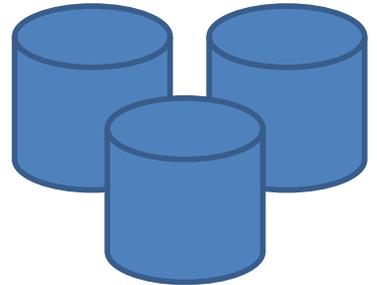
Data Context



Data-Enabled Reporting Environment



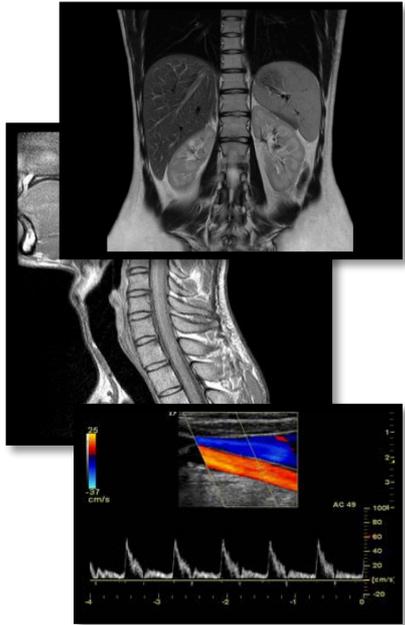
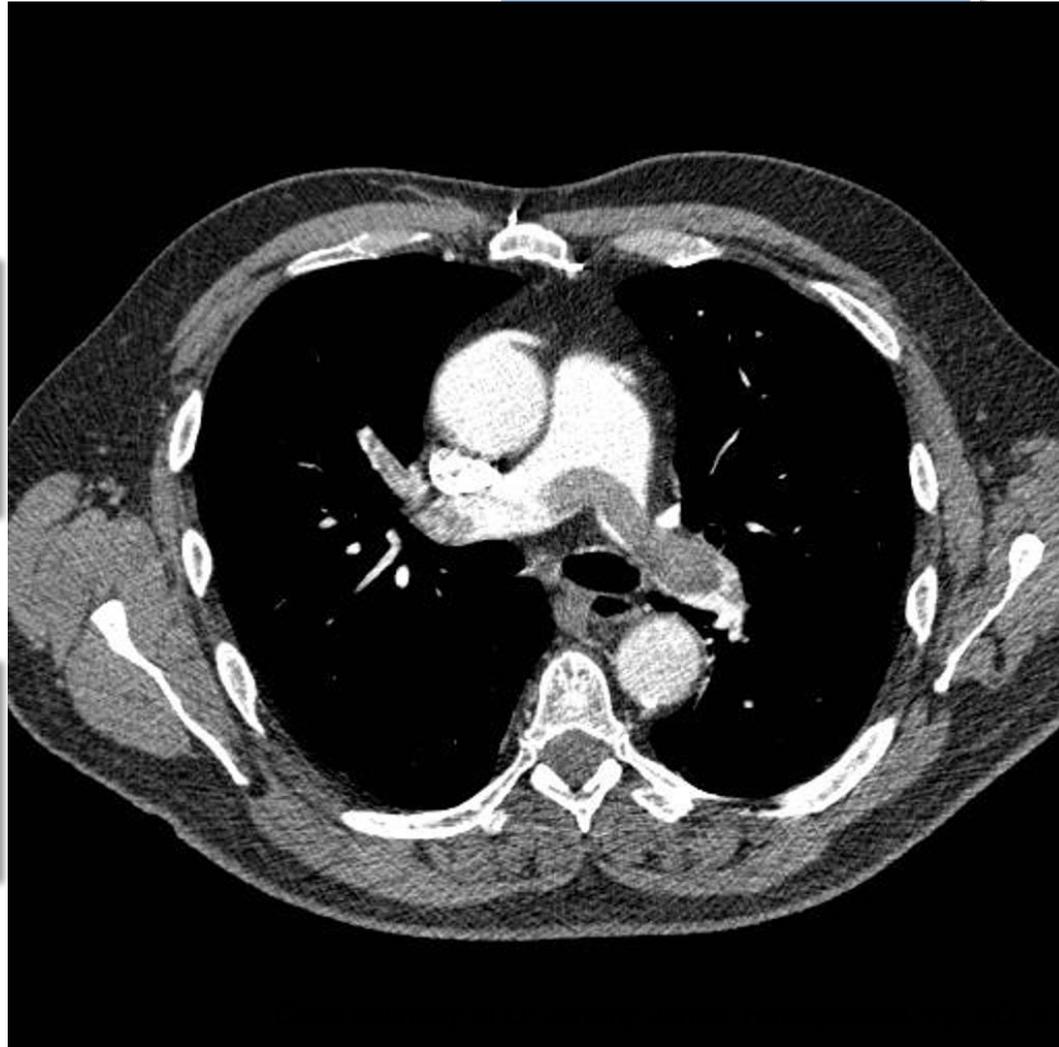
EMR



Registries

Courtesy of Dr. Tarik Alkasab, MGH, ACR2016

Imaging Driven Care Pathway Example

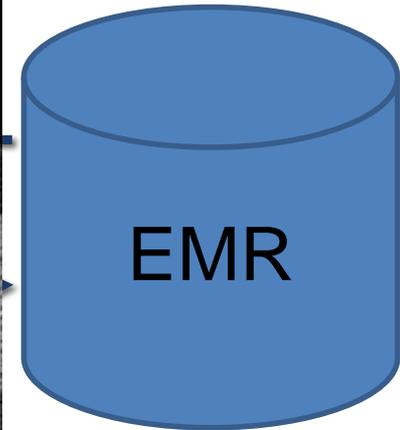


1. Image Acquisition

Optimize imaging parameters for data extraction

3. Data-oriented Interpretation

Visualize candidate emboli
Demonstrate septum, reflux



5. Treatment Guidance

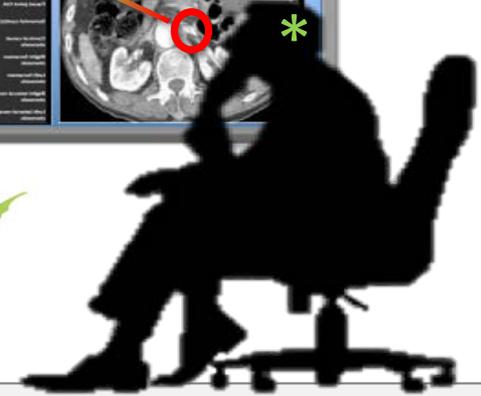
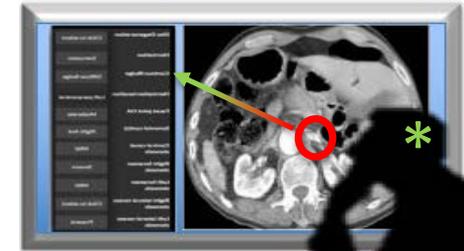
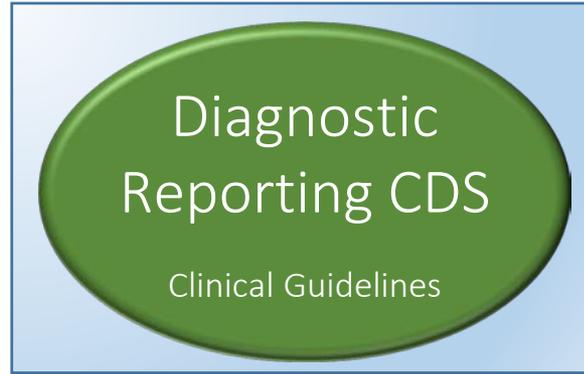
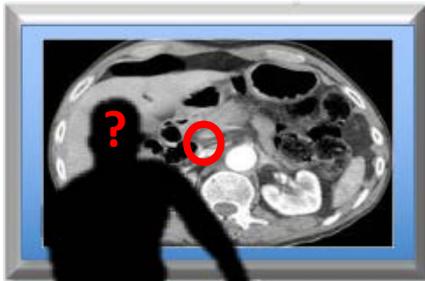
Discharge or
Anticoagulate or
Thrombolyse or
Order TTE or
Consult surgery

06

Courtesy of Dr. Tarik Alkasab, MGH, ACR2016

ACRASSIST

IMPROVING THE CARE PROCESS



Radiologist without CDS

Indeterminate 3.5 cm adrenal nodule.
Consider surgical consultation.



PCP 1

No further work-up



PCP 2

Requests surgical consult.



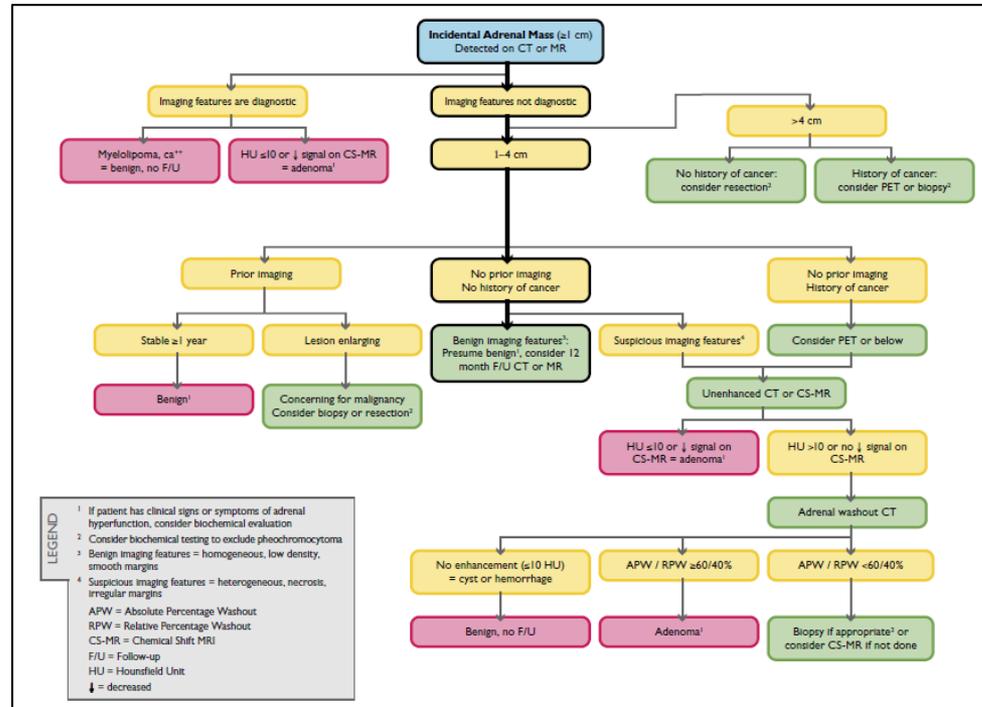
PCP 3

Requests CT
(Adrenal-mass protocol)

MONITORING

- **Broad Monitoring Opportunities**
 - Recommendations
 - Compliance with Guidance
 - Outcomes
- **Examples for MACRA Measures**
 - Use of structured referral notes for Clinical Practice Improvement
 - Quality reporting measures based on Lung RADS

Create Content



https://github.com/acrscm/acr-assist-decision-support-schema

The screenshot shows the GitHub repository page for `acrscm/acr-assist-decision-support-schema`. The repository has 5 watches, 1 star, and 0 forks. It is currently on the `master` branch. The commit history shows a recent commit by Sujith adding an ID field for decisionpoint, followed by several other commits related to the schema and README.

Repository Statistics:

- 20 commits
- 1 branch
- 0 releases
- 3 contributors
- MIT license

Branch: master | [New pull request](#) | [Create new file](#) | [Upload files](#) | [Find file](#) | [Clone or download](#)

Commit Message	Author	Time
Sujith added id for decisionpoint	Sujith	Latest commit 669eacb on May 31
Hello RADS		added Id field for decisionpoint 4 months ago
ACR Assist Schema Technical White paper.pdf		added id for decisionpoint 4 months ago
ACRAssist_xml_schema.mc		added Id field for decisionpoint 4 months ago
LICENSE		Initial commit a year ago
README.md		Initialize README.md 4 months ago

[README.md](#)



Technical White Paper – ACR Assist

Proposed Format for Specifying Point-of-Care Computer-Assisted Reporting/Decision Support Modules for Radiologists

Tarik K. Alkasab, MD, PhD; Harlan B. Harvey, MD, JD; Sepehr Sadeghi; Sujith Surendran
Nair Latha

```
217     }
218 Rules = element Rules { DecisionPoint }
219 # { branchModifiers, DecisionPoint }
220 DataElementRef =
221     element DataElementRef {
222         attribute DataElementId { xsd:IDREF },
223         empty
224     }
225 ChoiceRef =
226     element ChoiceRef {
227         attribute DataElementId { xsd:IDREF },
228         attribute ChoiceValue { xsd:token },
229         empty
230     }
231 branchModifiers =
232     # element RequiredDataElements { DataElementRef+ }?,
233     element NotRelevantDataElements { DataElementRef+ }?
234 # element RelevantDataElements { DataElementRef+ }?,
235 # element NotValidChoices { ChoiceRef+ }?
236 DecisionPoint =
237     element DecisionPoint {
238         attribute Id { xsd:ID },
239         element Label { text },
240         element Description { text }?,
241         # HtmlContent -> text
242         # element DescriptionImage { imageElements }?,
243         element Branch {
```

Open CAR/DS White Paper

ARTICLE IN PRESS

ORIGINAL ARTICLE

Creation of an Open Framework for Point-of-Care Computer-Assisted Reporting and Decision Support Tools for Radiologists

Tarik K. Alkasab, MD, PhD^{a,b}, Bernardo C. Bizzo, MD^{a,b}, Lincoln L. Berland, MD^d, Sujith Nair, BTech^e, Pari V. Pandharipande, MD, MPH^{a,b,c}, H. Benjamin Harvey, MD, JD^{a,b,c}

Abstract

Decreasing unnecessary variation in radiology reporting and producing guideline-concordant reports is fundamental to radiology's success in value-based payment models and good for patient care. In this article, we present an open authoring system for point-of-care clinical decision support tools integrated into the radiologist reporting environment referred to as the computer-assisted reporting and decision support (CAR/DS) framework. The CAR/DS authoring system, described herein, includes: (1) a definition format for representing radiology clinical guidelines as structured, machine-readable Extensible Markup Language documents and (2) a user-friendly reference implementation to test the fidelity of the created definition files with the clinical guideline. The proposed definition format and reference implementation will enable content creators to develop CAR/DS tools that voice recognition software (VRS) vendors can use to extend the commercial tools currently in use. In making the definition format and reference implementation software freely available, we hope to empower individual radiologists, expert groups such as the ACR, and VRS vendors to develop a robust ecosystem of CAR/DS tools that can further improve the quality and efficiency of the patient care that our field provides. We hope that this initial effort can serve as the basis for a community-owned open standard for guideline definition that the imaging informatics and VRS vendor communities will embrace and strengthen. To this end, the ACR Assist™ initiative is intended to make the College's clinical content, including the Incidental Findings Committee White Papers, available for decision support tool creation based upon the herein described CAR/DS framework.

Key Words: Radiology, quality, guideline, clinical decision support, reporting, structured, standardized, value

J Am Coll Radiol 2017; ■:■-■. Copyright © 2017 American College of Radiology

Encode Content via Open CAR/DS

Features: The elements of a described lesion will be used to determine the output of the algorithm. Includes *synonyms* of those features that might be used in reports.

Decision Tree: The logic which determines the output of the algorithm based on a lesion's features.

End Points: Templates of the generated text to be inserted into the body, impression, and recommendations of reports.

<algorithm>

```
<features>
  <feature name="size" type="numeric"/>
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    <choice name="left_side">left</choice>
    <choice name="right_side">right</choice>
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  <feature name="uniformly_cystic" type="present_absent" default="absent">
    <synonym>fluid density</synonym>
    <synonym>simple cyst</synonym>
  </feature>
  <feature name="density" type="numeric"/>
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```

```
<decision_tree>
  <if feature="uniformly_cystic" value="present">
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  <if feature="hypodense" value="present">
    <if feature="stable" value="present">
      <end_point ref="hypodense_stable"/>
    </if>
    <else>
      <end_point ref="hypodense_no_priors"/>
    </else>
  </if>
  <if feature="macroscopic_fat" value="present">
    <end_point ref="macroscopic_fat"/>
  </if>
  <if feature="old_hemorrhage" value="present">
```

```
<end_points>
  <end_point id="hypodense_stable">
    <body>In the {{side}} adrenal gland{{series_image}}, the previously seen {{size}} mm lesion is homogeneously low density (10 HU or less on non-contrast-enhanced images) and therefore most consistent with an adenoma.</body>
    <impression>{{size}} mm nodule in the {{side}} adrenal gland, similar to prior. Radiologic findings are most consistent with a benign adrenal adenoma.</impression>
    <recommendation>As adrenal adenomas may be hormonally active with subclinical suggest further evaluation for endocrine hyperfunction for most patients. Grumbach MM et al. (2003) "Management of the clinically inapparent adrenal ('incidentaloma')." Ann Int Med 138:424-429 and Young, W. (2007) "The incidental discovered adrenal mass," New Engl J Med 356:601-610.</recommendation>
  </end_point>
  <end_point id="hypodense_no_priors">
```

</algorithm>

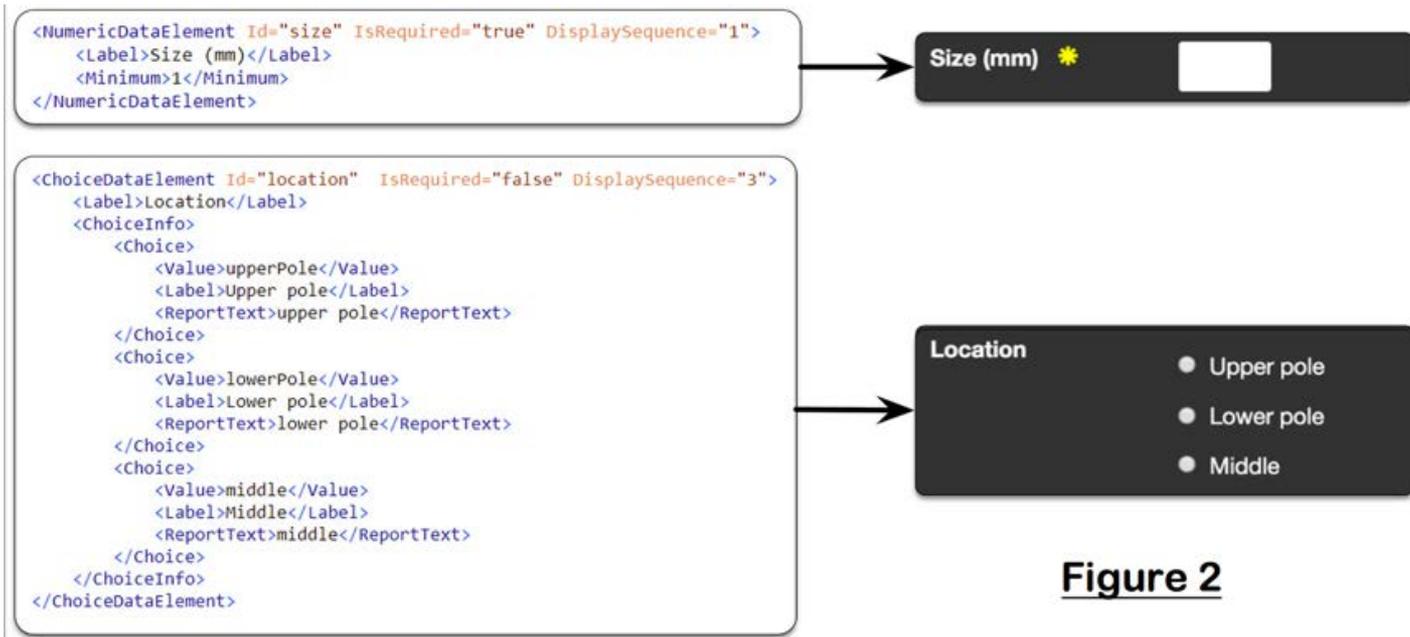
Open CAR/DS: Metadata

Figure 1

Metadata
Info Unique ID Label Description References Diagrams Contact Information
Ontology Anatomic Regions Possible Diagnoses
Applicability Exams Age Groups Sexes
Report Cues Context Phrases Keywords Negation Phrases Voice Activation Triggers

```
<Metadata>
  <Label>Renal Lesion</Label>
  <ID>1e721d65-c96c-4da5-810f-2c95952946b4</ID>
  <SchemaVersion>1.1</SchemaVersion>
  <Info>
    <Description>
      Guidance for incidentally detected renal cysts or masses identified on CT.
    </Description>
    <References>
      <Citation PubmedId="20889105" Url="http://www.jacr.org/article/S1546-1440(10)00330-3/abstract">
        Berland, L.L. et al. "Abdominal CT: White Paper of the ACR Incidental Findings Committee."
        J Am Coll Radiol 7: 754-73 (2010).
      </Citation>
    </References>
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        <Label>Cystic Renal mass on CT algorithm from JACR white paper.</Label>
      </Diagram>
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      <Diagram KeyDiagram="true" DisplaySequence="1">
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        <Label>Renal mass on CT flowchart.</Label>
      </Diagram>
      <Diagram KeyDiagram="true" DisplaySequence="4">
        <Location>Cyst Classification Chart.jpg</Location>
        <Label>Cyst Classification Chart.</Label>
      </Diagram>
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    Recommendations for renal mass management, based on Berland, et al., J Am Coll Radiol 7:754-73 (2010).
  </ReportCitationText>
  <Ontology>
    <AnatomicRegions CodingSystem="RADLEX">
      <Region Code="RID205">Kidney</Region>
    </AnatomicRegions>
    <PossibleDiagnoses CodingSystem="RADLEX">
      <Diagnosis Code="RID35811">Renal cyst</Diagnosis>
    </PossibleDiagnoses>
  </Ontology>
  <ApplicableExams>
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    <BodyRegion Code="ABDOMEN" CodingSystem="RADLEX-PLAYBOOK"/>
    <BodyRegion Code="CHEST" CodingSystem="RADLEX-PLAYBOOK"/>
    <BodyRegion Code="SPINE" CodingSystem="RADLEX-PLAYBOOK"/>
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  <ApplicableSexes Value="Both"/>
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      <Keyword>lesion</Keyword>
      <Keyword>cyst</Keyword>
      <Keyword>tumor</Keyword>
      <Keyword>hypodensity</Keyword>
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  </VoiceActivation>
</Metadata>
```

Open CAR/DS: Data Elements



Committee Review - XML view

ACR Assist™ Hi Laura Logout

XML Modules <<

- ACR LI-RADS (1.0) 2
- AdrenaCTXML (1.0) 1**
- HeIo_RADS (1.0)
- LI-RADS Ver 2 (1.0)

Metadata 1 DataElements Path View End Points XML View

```
<?xml version="1.0" encoding="utf-16"?>
<?xml-model href="..\XML Schema\ACRAssist_xml_schema.rnc" type="application/relax-ng-compact-syntax"?>
<ReportingModule>
  <Metadata>
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    <SchemaVersion>1.0</SchemaVersion>
    <RuleVersion>2.0</RuleVersion>
  </Info>
  <Description>Recommendations for incidental adrenal masses</Description>
  <References>
    <Citation></Citation>
  </References>
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      <Location>key:image.PNG</Location>
      <Label>Adrenal CT</Label>
    </Diagram>
  </Diagrams>
  <Contact>
    <Name>ACR Assist</Name>
    <Email>acr-assist@acr.org</Email>
    <Institution>American College of Radiology</Institution>
  </Contact>
</Info>
</ReportCitationText />
</Ontology>
```

Decision Tree >>

```
graph TD
    Root["Incidental, Asymptomatic Adrenal Mass (<math>\geq 1\text{ cm}</math>)  
Detected on any CT or MR exam"]
    Root --> Diagnostic["Diagnostic Benign Imaging Features  
Myelolipoma, No enhancement, Ca++ = Benign, no FUJ  
<math>\leq 10\text{ HU}</math> or <math>\leq 10\text{ HU}</math> on CT-MR  
=> Benign adenoma* no FUJ"]
    Root --> Indeterminate["Indeterminate Imaging Features"]
    Indeterminate --> Size14["1-4 cm"]
    Indeterminate --> Size4[">= 4 cm"]
    Size14 --> Prior["Prior Imaging"]
    Size14 --> NoPrior["No prior Imaging  
No Cancer Hx"]
    Prior --> Stable["Stable <math>\geq 1\text{ year}</math>"]
    Prior --> New["New or enlarging"]
    Stable --> StableRes["Benign*, no FUJ"]
    New --> NewRes["Suspicious for neoplasm  
Cancer Hx: consider PET-CT or Bx*  
No Cancer Hx: consider resection!"]
    NoPrior --> Size12["1-2 cm, Probably benign*  
Consider 12 months F/U adrenal CT*"]
    NoPrior --> Size24[">2cm, <math>\leq 4\text{ cm}</math>"]
    NoPrior --> Size4[">4 cm"]
    Size24 --> AdrenalCT["Adrenal CT*"]
    Size4 --> NoCancer["No Cancer Hx:  
consider resection"]
    Size4 --> Cancer["Cancer Hx, or  
Bx or PET-CT"]
    NoCancer --> AdrenalCT
    Cancer --> AdrenalCT
    AdrenalCT --> AdrenalCT1["Adrenal CT at 12 months"]
    AdrenalCT --> AdrenalCT2["Adrenal CT at 24 months"]
    AdrenalCT --> AdrenalCT3["Adrenal CT at 36 months"]
    AdrenalCT --> AdrenalCT4["Adrenal CT at 48 months"]
    AdrenalCT --> AdrenalCT5["Adrenal CT at 60 months"]
    AdrenalCT --> AdrenalCT6["Adrenal CT at 72 months"]
    AdrenalCT --> AdrenalCT7["Adrenal CT at 84 months"]
    AdrenalCT --> AdrenalCT8["Adrenal CT at 96 months"]
    AdrenalCT --> AdrenalCT9["Adrenal CT at 108 months"]
    AdrenalCT --> AdrenalCT10["Adrenal CT at 120 months"]
    AdrenalCT --> AdrenalCT11["Adrenal CT at 132 months"]
    AdrenalCT --> AdrenalCT12["Adrenal CT at 144 months"]
    AdrenalCT --> AdrenalCT13["Adrenal CT at 156 months"]
    AdrenalCT --> AdrenalCT14["Adrenal CT at 168 months"]
    AdrenalCT --> AdrenalCT15["Adrenal CT at 180 months"]
    AdrenalCT --> AdrenalCT16["Adrenal CT at 192 months"]
    AdrenalCT --> AdrenalCT17["Adrenal CT at 204 months"]
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    AdrenalCT --> AdrenalCT19["Adrenal CT at 228 months"]
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    AdrenalCT --> AdrenalCT21["Adrenal CT at 252 months"]
    AdrenalCT --> AdrenalCT22["Adrenal CT at 264 months"]
    AdrenalCT --> AdrenalCT23["Adrenal CT at 276 months"]
    AdrenalCT --> AdrenalCT24["Adrenal CT at 288 months"]
    AdrenalCT --> AdrenalCT25["Adrenal CT at 300 months"]
    AdrenalCT --> AdrenalCT26["Adrenal CT at 312 months"]
    AdrenalCT --> AdrenalCT27["Adrenal CT at 324 months"]
    AdrenalCT --> AdrenalCT28["Adrenal CT at 336 months"]
    AdrenalCT --> AdrenalCT29["Adrenal CT at 348 months"]
    AdrenalCT --> AdrenalCT30["Adrenal CT at 360 months"]
    AdrenalCT --> AdrenalCT31["Adrenal CT at 372 months"]
    AdrenalCT --> AdrenalCT32["Adrenal CT at 384 months"]
    AdrenalCT --> AdrenalCT33["Adrenal CT at 396 months"]
    AdrenalCT --> AdrenalCT34["Adrenal CT at 408 months"]
    AdrenalCT --> AdrenalCT35["Adrenal CT at 420 months"]
    AdrenalCT --> AdrenalCT36["Adrenal CT at 432 months"]
    AdrenalCT --> AdrenalCT37["Adrenal CT at 444 months"]
    AdrenalCT --> AdrenalCT38["Adrenal CT at 456 months"]
    AdrenalCT --> AdrenalCT39["Adrenal CT at 468 months"]
    AdrenalCT --> AdrenalCT40["Adrenal CT at 480 months"]
    AdrenalCT --> AdrenalCT41["Adrenal CT at 492 months"]
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    AdrenalCT --> AdrenalCT44["Adrenal CT at 528 months"]
    AdrenalCT --> AdrenalCT45["Adrenal CT at 540 months"]
    AdrenalCT --> AdrenalCT46["Adrenal CT at 552 months"]
    AdrenalCT --> AdrenalCT47["Adrenal CT at 564 months"]
    AdrenalCT --> AdrenalCT48["Adrenal CT at 576 months"]
    AdrenalCT --> AdrenalCT49["Adrenal CT at 588 months"]
    AdrenalCT --> AdrenalCT50["Adrenal CT at 600 months"]
    AdrenalCT --> AdrenalCT51["Adrenal CT at 612 months"]
    AdrenalCT --> AdrenalCT52["Adrenal CT at 624 months"]
    AdrenalCT --> AdrenalCT53["Adrenal CT at 636 months"]
    AdrenalCT --> AdrenalCT54["Adrenal CT at 648 months"]
    AdrenalCT --> AdrenalCT55["Adrenal CT at 660 months"]
    AdrenalCT --> AdrenalCT56["Adrenal CT at 672 months"]
    AdrenalCT --> AdrenalCT57["Adrenal CT at 684 months"]
    AdrenalCT --> AdrenalCT58["Adrenal CT at 696 months"]
    AdrenalCT --> AdrenalCT59["Adrenal CT at 708 months"]
    AdrenalCT --> AdrenalCT60["Adrenal CT at 720 months"]
    AdrenalCT --> AdrenalCT61["Adrenal CT at 732 months"]
    AdrenalCT --> AdrenalCT62["Adrenal CT at 744 months"]
    AdrenalCT --> AdrenalCT63["Adrenal CT at 756 months"]
    AdrenalCT --> AdrenalCT64["Adrenal CT at 768 months"]
    AdrenalCT --> AdrenalCT65["Adrenal CT at 780 months"]
    AdrenalCT --> AdrenalCT66["Adrenal CT at 792 months"]
    AdrenalCT --> AdrenalCT67["Adrenal CT at 804 months"]
    AdrenalCT --> AdrenalCT68["Adrenal CT at 816 months"]
    AdrenalCT --> AdrenalCT69["Adrenal CT at 828 months"]
    AdrenalCT --> AdrenalCT70["Adrenal CT at 840 months"]
    AdrenalCT --> AdrenalCT71["Adrenal CT at 852 months"]
    AdrenalCT --> AdrenalCT72["Adrenal CT at 864 months"]
    AdrenalCT --> AdrenalCT73["Adrenal CT at 876 months"]
    AdrenalCT --> AdrenalCT74["Adrenal CT at 888 months"]
    AdrenalCT --> AdrenalCT75["Adrenal CT at 900 months"]
    AdrenalCT --> AdrenalCT76["Adrenal CT at 912 months"]
    AdrenalCT --> AdrenalCT77["Adrenal CT at 924 months"]
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    AdrenalCT --> AdrenalCT80["Adrenal CT at 960 months"]
    AdrenalCT --> AdrenalCT81["Adrenal CT at 972 months"]
    AdrenalCT --> AdrenalCT82["Adrenal CT at 984 months"]
    AdrenalCT --> AdrenalCT83["Adrenal CT at 996 months"]
    AdrenalCT --> AdrenalCT84["Adrenal CT at 1008 months"]
    AdrenalCT --> AdrenalCT85["Adrenal CT at 1020 months"]
    AdrenalCT --> AdrenalCT86["Adrenal CT at 1032 months"]
    AdrenalCT --> AdrenalCT87["Adrenal CT at 1044 months"]
    AdrenalCT --> AdrenalCT88["Adrenal CT at 1056 months"]
    AdrenalCT --> AdrenalCT89["Adrenal CT at 1068 months"]
    AdrenalCT --> AdrenalCT90["Adrenal CT at 1080 months"]
    AdrenalCT --> AdrenalCT91["Adrenal CT at 1092 months"]
    AdrenalCT --> AdrenalCT92["Adrenal CT at 1104 months"]
    AdrenalCT --> AdrenalCT93["Adrenal CT at 1116 months"]
    AdrenalCT --> AdrenalCT94["Adrenal CT at 1128 months"]
    AdrenalCT --> AdrenalCT95["Adrenal CT at 1140 months"]
    AdrenalCT --> AdrenalCT96["Adrenal CT at 1152 months"]
    AdrenalCT --> AdrenalCT97["Adrenal CT at 1164 months"]
    AdrenalCT --> AdrenalCT98["Adrenal CT at 1176 months"]
    AdrenalCT --> AdrenalCT99["Adrenal CT at 1188 months"]
    AdrenalCT --> AdrenalCT100["Adrenal CT at 1200 months"]
```

Committee Review - Metadata

Hi Laura [Logout](#)

XML Modules <<

- ACR LI-RADS (1.0) 2
- AdrenalCTXML (1.0) 1**
- Hello_RADS (1.0)
- LI-RADS Ver 2 (1.0)

Metadata 1 | DataElements | Path View | End Points | XML View

Schema Version
1.0

Description
Recommendations for incidental adrenal masses

Citation 1
Not Available

Citation Reference

Contacts
Institution : American College of Radiology
Name : ACR Assist
Email : acr-assist@acr.org

Associated Modalities

Citation

L iberland
9/18/2017 10:24 am
Mayo-Smith WW, et al. Management of Adrenal Masses: A White Paper of the A

R reviewer1
9/18/2017 1:52 am
hi

[Save Changes](#)

XML Modules <<

© 2017 - American College of Radiol

Committee Review – Data Elements

Hi Laura Logout

XML Modules <<

- ACR LI-RADS (1.0) 2
- AdrenalCTXML (1.0) 1
- Hello_RADS (1.0)
- LI-RADS Ver 2 (1.0)

XML Modules <<

Metadata 1 DataElements Path View End Points XML View

Incidental, Asymptomatic Adrenal Mass (>1 cm) Detected on any CT or MR exam

Dataelement Type : Choice

Choices: Diagnostic Benign Imaging Features Indeterminate Imaging Features

Diagnostic Benign Imaging Features (Required)

+ Size (cm) (Required)

+ Cancer Hx (Required)

+ Prior imaging (Required)

+ Cancer Hx prior imaging (Required)

Diagnostic Benign Imaging Features

L Iberland
9/17/2017 1:02 pm

The next statement within the same box is "≤10HU, or decreased signal on CS-MR." Th

L Iberland
9/17/2017 1:01 pm

Problem with following the text on the flowc too tightly is that are not differentiating the

Save Changes

Decision Tree >>

```

graph TD
    Root[Incidental, Asymptomatic Adrenal Mass (>1 cm) Detected on any CT or MR exam] --> DBIF[Diagnostic Benign Imaging Features]
    Root --> IIF[Indeterminate Imaging Features]
    
    DBIF --> Myel[Myelolipoma, No enhancement, Ca++ = Benign, no F/U ≤10 HU or ↓ Signal on CS-MR = Benign adenoma, no F/U]
    
    IIF --> S14[1-1.4 cm]
    IIF --> S4[≥1.4 cm]
    
    S14 --> PI[Prior imaging]
    S14 --> NPI[No prior imaging No Cancer Hx]
    
    PI --> S1Y[Stable ≥ 1 year]
    PI --> NE[New or enlarging]
    
    S1Y --> BNFU[Benign, no F/U]
    NE --> SM[Suspicious for neoplasm = Cancer Hx, consider PET-CT or Ex! No Cancer Hx: consider resection!]
    
    NPI --> S12[1-2 cm, Probably benign! Consider 12 month F/U adrenal CT+]
    NPI --> S24[>2cm, <4cm*]
    NPI --> AC[Adrenal CT*]
    
    S24 --> AC
    
    S4 --> NCH[No Cancer Hx: consider resection!]
    S4 --> CH[+ Cancer Hx, or Bk or PET-CT]
    
    AC --> RD[Reduced dose NCCT ≤10 HU = benign adenoma, no F/U]
    AC --> NCCT10[NCCT =10]
    
    RD --> AC2[Adrenal CT**]
    NCCT10 --> AC2
    
    AC2 --> End1[ ]
    AC2 --> End2[ ]
    AC2 --> End3[ ]
    
```

XML Modules <<

- ACR LI-RADS (1.0) 2
- AdrenalCTXML (1.0)**
- Hello_RADS (1.0)
- LI-RADS Ver 2 (1.0)

- Metadata
- DataElements
- Path View
- End Points
- XML View

- + Incidental, Asymptomatic Adrenal Mass (≥1 cm) Detected on any CT or MR exam (Required) 
- + Diagnostic Benign Imaging Features (Required) 
- Size (cm) (Required) 
- + Cancer Hx (Required) 
- + Prior Imaging (Required) 
- + Cancer Hx prior imaging (Required) 
- + HU on NCCT (Required) 
- + Adrenal CT washout (Required) 

Size (cm)

L iberland
9/16/2017 6:30 pm
Need to add units, as well (cm). Also, it NOT be an integer.

Save Changes

XML Modules <<

Committee Review – Pathway View

Hi Laura Logout

XML Modules <<

- AGR LI-RADS (1.0) 2
- AdrenalCTXML (1.0)
- Hello_RADS (1.0)
- LI-RADS Ver 2 (1.0)

Metadata
DataElements
Path View
End Points
XML View

+ Incidental, Asymptomatic Adrenal Mass (≥1 cm) Detected on any CT or MR exam

+ Diagnostic Benign Imaging Features

- Indeterminate Imaging features

Mass Size(cm)

≥ 4 cm

Cancer Hx

No Cancer Hx	Consider resection
+ Cancer Hx	Consider Bx or PET-CT

+ 1-4cm

Decision Tree >>

```

graph TD
    Root[Incidental, Asymptomatic Adrenal Mass (≥1 cm)  
Detected on any CT or MR exam] --> Benign[Diagnostic Benign Imaging Features]
    Root --> Indeterminate[Indeterminate Imaging Features]
    
    Benign --> BenignBox["Myelolipoma, No enhancement,  
Ca++ = Benign, no FUJ,  
≤10 HU or ↓ Signal on C-SMR  
= Benign adenoma!, no FUJ"]
    
    Indeterminate --> Size14[1-4 cm]
    Indeterminate --> Size4[≥ 4 cm]
    
    Size14 --> Prior14[Prior imaging]
    Size14 --> NoPrior14[No prior imaging  
No Cancer Hx]
    
    Prior14 --> Stable14["Stable ≥ 1 year"]
    Prior14 --> New14["New or enlarging"]
    
    Stable14 --> Benign14["Benign!, no FUJ"]
    New14 --> Suspicious14["Suspicious for neoplasm  
+ Cancer Hx: consider PET-CT or Bx!  
No Cancer Hx: consider resection?"]
    
    NoPrior14 --> Size14_12["1-2 cm, Probably benign!  
Consider 12 month F.U. adrenal CT*"]
    NoPrior14 --> Size14_24["≥2cm, <4cm*"]
    
    Size4 --> NoCancer4["No Cancer Hx:  
consider resection?"]
    Size4 --> Cancer4["+ Cancer Hx:  
or Bx or PET-CT"]
    
    NoPrior14 --> NoPrior4["No prior imaging,  
+ Cancer Hx &  
isolated? adrenal mas"]
    NoPrior4 --> AdrenalCT4["Adrenal CT*"]
    
    AdrenalCT4 --> NCCT4["NCCT >10"]
    AdrenalCT4 --> NCCT4_10["Reduced dose NCCT ≤10 HU  
= benign adenoma!, no FUJ"]
    
    NCCT4 --> AdrenalCT_10["Adrenal CT @"]
    
```

XML Modules <<

Committee Review – Endpoint View



XML Modules <<

- ACR LI-RADS (1.0) 2
- AdrenalCTXML (1.0)**
- Hello_RADS (1.0)
- LI-RADS Ver 2 (1.0)

Metadata DataElements Path View **End Points** XML View

Choose an endpoint from below:
Consider 12 month F/U ▼

REPORT TEXT
Consider 12 month F/U adrenal CT or resection

– Path 1 

Mass Size(cm)	1-4cm
PicrImagingCondition	New or enlarging
Cancer Hx	No Cancer Hx

CDS Simulator

ACR Assist™ Simulator

XML Modules

AdrenalCTXML

ACR LI-RADS

Hello_RADS

Hello_RADS_CE

ACR LI-RADS V2

LiverLesionCT

Incidental, Asymptomatic Adrenal Mass (≥1 cm) Detected on any CT or MR exam

Diagnostic Benign imaging Features

Indeterminate Imaging Features

Diagnostic Benign Imaging Features

Myelolipoma, No enhancement, Ca++

≤10 HU or drop in signal on CS-MR

Size (cm) i

No Cancer Hx

Cancer Hx

Prior imaging

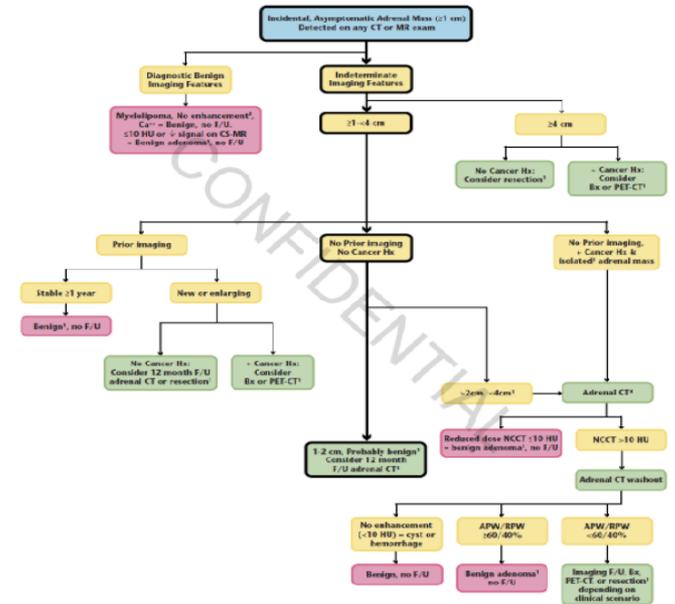
Stable ≥ 1 year

New or enlarging

No prior imaging, No Cancer Hx

No prior imaging, Cancer Hx and isolated adrenal mass

Adrenal CT



CDS Simulator con't

← → ↻ 🏠 localhost:3000

🌟 WP 🔍 G 📄

📁 Apos 📁 DART 📁 Common 📁 Admin 📁 ACR apps & links 📁 Sharepoint 📁 Personal 📁 External Apps 📁 TBI links 📁 Assist 📁 DSI 📁 youtube deep learnin » 📁 Other bookmarks

AC Rads

XML Modules

AdrenalCTXML

ACR LI-RADS

Hello_RADS

Hello_RADS_CE

ACR LI-RADS V2

LiverLesionCT

JAVA_HOME is not defined. So we are unable to validate XML.

Adrenal CT

Incidental, Asymptomatic Adrenal Mass (≥1 cm) Detected on any CT or MR exam

Size (cm) ⓘ

Prior imaging

Stable ≥ 1 year

New or enlarging

No prior imaging, No Cancer Hx

No prior imaging, Cancer Hx and isolated adrenal mass

Diagnostic Benign Imaging Features

Indeterminate Imaging Features

Report Text **Findings** ▾

Benign, no F/U

CDS In Action (e.g. PowerScribe 360)

PowerScribe 360 | Reporting

File Edit View Insert Format Tools Speech Help

Close Wet Read Draft Prelim & Overread Prelim Sign Discard Qty Check FollowUp PACS Content Wizard... mPower... Clinical Insights...

Create AutoText New

Fields (16)

- Comparison
- * Dose
- Liver
- Bile ducts
- Gallbladder
- Pancreas
- Spleen
- Adrenals
- Kidneys
- Bowel
- Lymph nodes
- Peritoneum
- Vessels
- Retroperitoneum
- Abdominal wall
- Bones

Report - AARON, AARON - 41238192

FINDINGS:

ABDOMEN

- Liver: [Normal]
- Bile ducts: [Normal]
- Gallbladder: [No calcified gallstones. Normal caliber wall]
- Pancreas: [Normal]
- Spleen: [Normal]
- Adrenals: [A 3.2 cm lesion in the left adrenal gland (series 5, image 4) has indeterminate features]
- Kidneys: [Normal]
- Bowel: [Normal caliber]
- Mesenteric lymph nodes: [No enlarged mesenteric lymph nodes]
- Peritoneum: [No ascites or free air; no fluid collection]
- Vessels: [Atherosclerotic changes]
- Retroperitoneum: [Normal]
- Abdominal wall: [Normal]
- Bones: [Normal]

IMPRESSION:

A 3.2 cm left adrenal lesion has indeterminate features for neoplasm. Recommend further evaluation with adrenal washout CT or chemical shift MRI.

Recommendations for incidental adrenal lesion management based on Berland, et al., J Am Coll Radiol 7:754-73 (2010).

Guidance: Adrenal Nodule

Include: Findings, Impression, Citation | Update Discard

Size (cm):	3.2
Side:	Left
Macroscopic Fat?	No
Density less than or equal 10 HU?	No
Stability compared to priors:	No priors
History Malignancy:	Unknown
Benign Features?	No
Series:	5
Image:	4

FINDINGS:
A 3.2 cm lesion in the left adrenal gland (series 5, image 4) has indeterminate features.

IMPRESSION:
A 3.2 cm left adrenal lesion has indeterminate features for neoplasm. Recommend further evaluation with adrenal washout CT or chemical shift MRI.

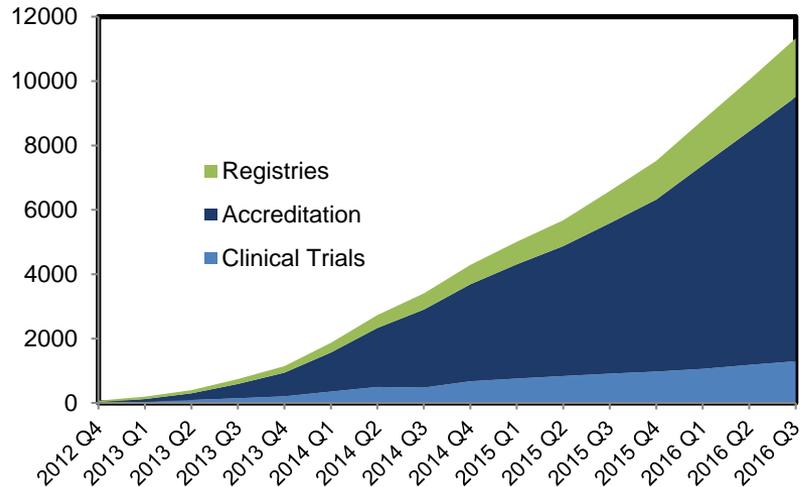
CITATION:
Recommendations for incidental adrenal lesion management based on Berland, et al., J Am Coll Radiol 7:754-73 (2010).

User: Kate Kovalenko | Drafts: 29 | Signing queue: 5 | Overreader: None selected (Site: CCH) | Disconnected

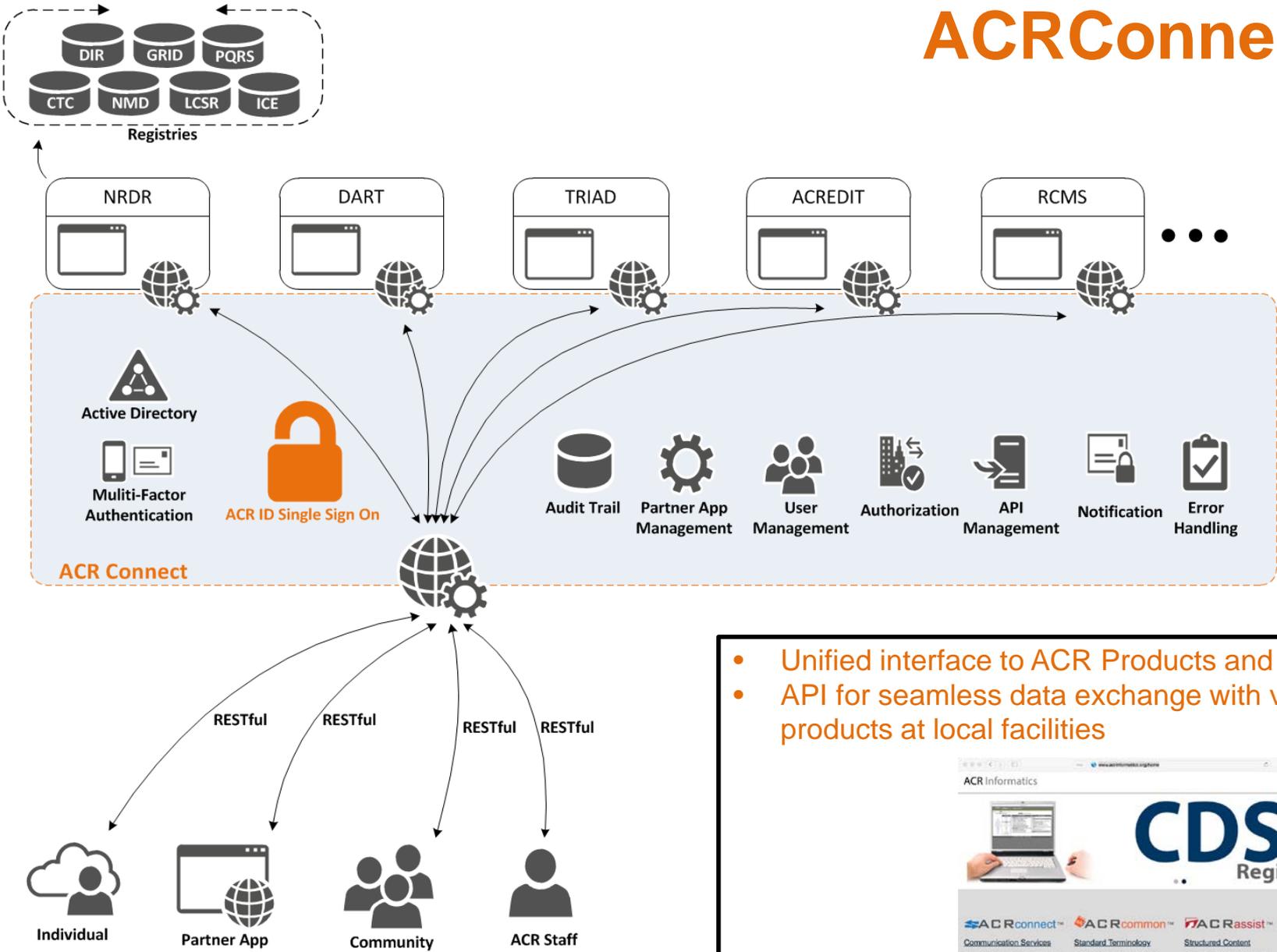
SUPPORTING TECHNOLOGIES

Data Transfer - TRIAD

- TRIAD (Transfer of Images and Data) – Developed by the ACR to fill a gap in enterprise-class solutions for clinical research image sharing
- Standards-friendly (DICOM, IHE) and FDA Compliant (CFR 21 Part 11)
- Intelligent Workflow
 - Provides Data Context and Structure via Integration with Control Systems
 - Profile-based De-Identification and Verification at ingestion
 - Rules-Based Validation and Advanced Processing at ingestion



ACRConnect



- Unified interface to ACR Products and Services
- API for seamless data exchange with vendor products at local facilities



ACRCommon

- Launched June 2015
- Unified terminology for ACR Products and Services with mappings to other controlled terminologies as appropriate (e.g. Radlex Playbook, CPT)
- Cloud-based authoring interface and API for system integration
- Current Status: Scenarios (1200+), Procedures (1500+), Findings (350+)

The screenshot displays the ACRCommon web application interface. The browser address bar shows the URL <https://common.acr.org/Terms>. The page title is "COMMON Terms". On the left, there is an "Administrator Menu" with options: Home, User Management (Users), Release Management (View Releases), Data Management (Predicates, COMMON Terms, Tagging Tool, Radlex Mapping Tool, Lookups, Radlex Procedures, Common API). The main content area includes a "COMMON Terms" header, a "Release:" dropdown, and a "Dimension:" dropdown set to "Procedures". Below this is a "Terms" table with columns: Common ID, VVID, Source, Dimension, Common Term, Tags Count, Merged Terms Count, and Last Modified. The table contains three rows of data. Below the terms table is a "Term Tags" table with columns: Tag Value ID, Source, Namespace, Role, Predicate, KPred, Value, and a final column with a value of 3. The Term Tags table contains four rows of data.

Common ID	VVID	Source	Dimension	Common Term	Tags Count	Merged Terms Count	Last Modified
4002517	114951	rule-set_2014_11	Procedures	CT,abdomen,unspec iv contrast	5	0	05-11-2015 12:19 PM
4002263	114044	rule-set_2014_11	Procedures	CT,abdomen,w iv contrast	6	0	08-25-2015 14:29 PM
4002264	114045	rule-set_2014_11	Procedures	CT,abdomen,wo iv contrast	6	0	05-11-2015 12:19 PM

Tag Value ID	Source	Namespace	Role	Predicate	KPred	Value	
4006332	Radlex Playbook	other_codes		RPID	RPID	3 - CTABU - V2.0_Core	3
4003212	2014_cis_seed	anatomic	defn	body_area	ba	abdomen	all
4003535	ruleset_2014_11	proc_attr	defn	modality	mod	CT	ct
4003736	ruleset_2014_11	proc_attr	defn	contrast	pcont	wo iv contrast	w

Projects IR Quality Registry Pilot

CSV Export

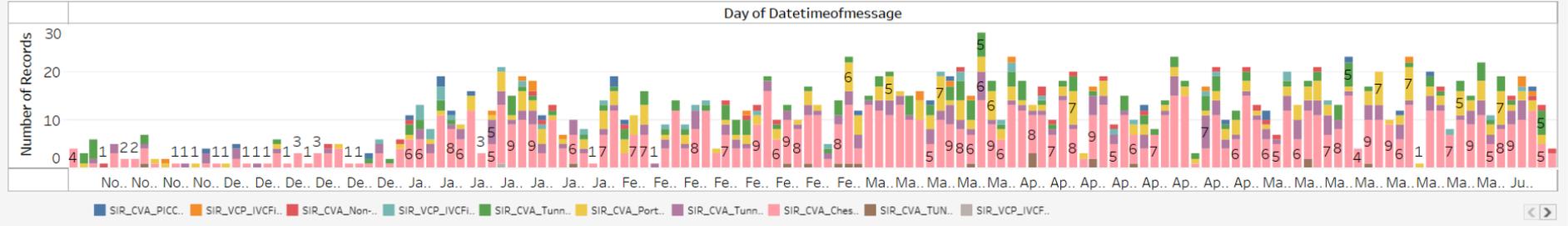
Undo Redo Revert Refresh Pause

Download Full Screen

IR REGISTRY

Facilityid: 104088 Additional Details Standardized Report: (All) Administrativesex: (All) Day of Datetimeofmessage: October 28, 2016 to June 8, 2017

Count by Week

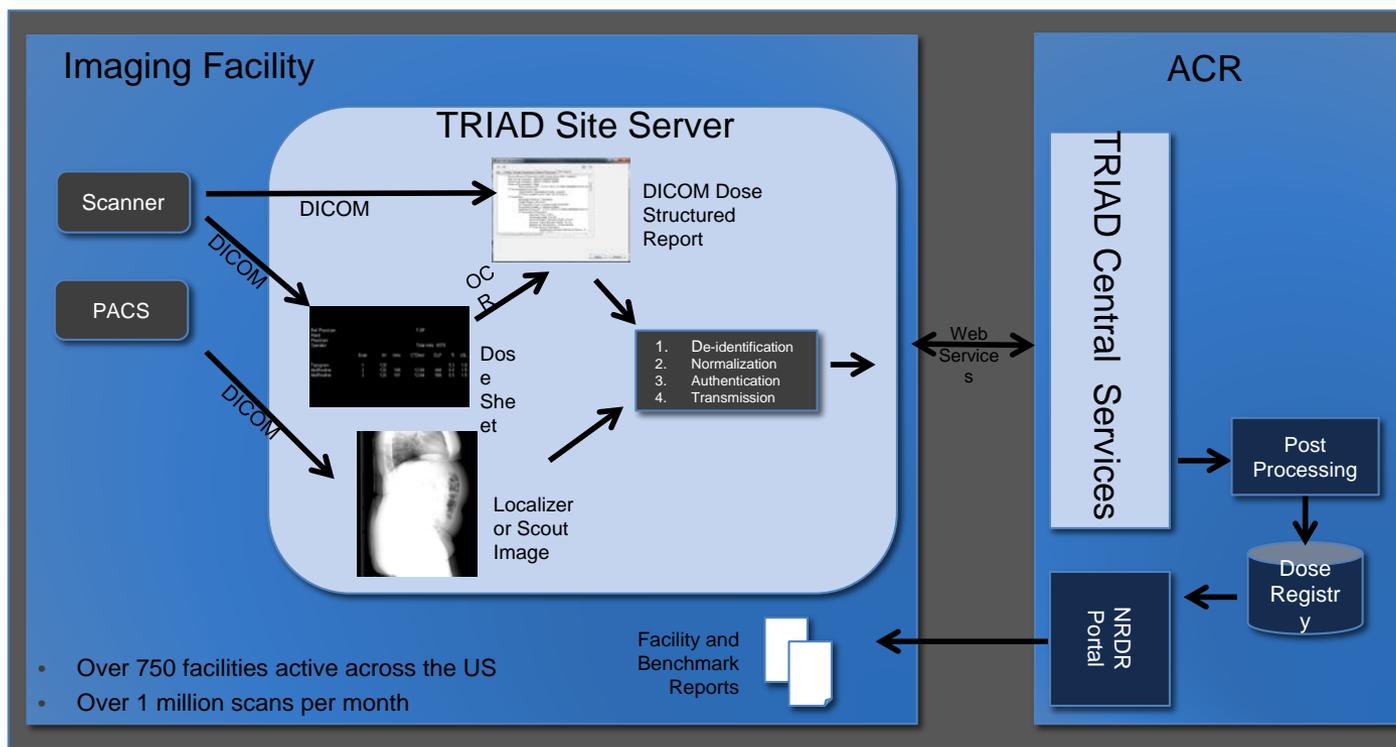


KERMA AREA PRODUCT

FLUOROSCOPY TIME

pr.	Procedurelabel	yt.	Procedurelabel
	81.30		813.02

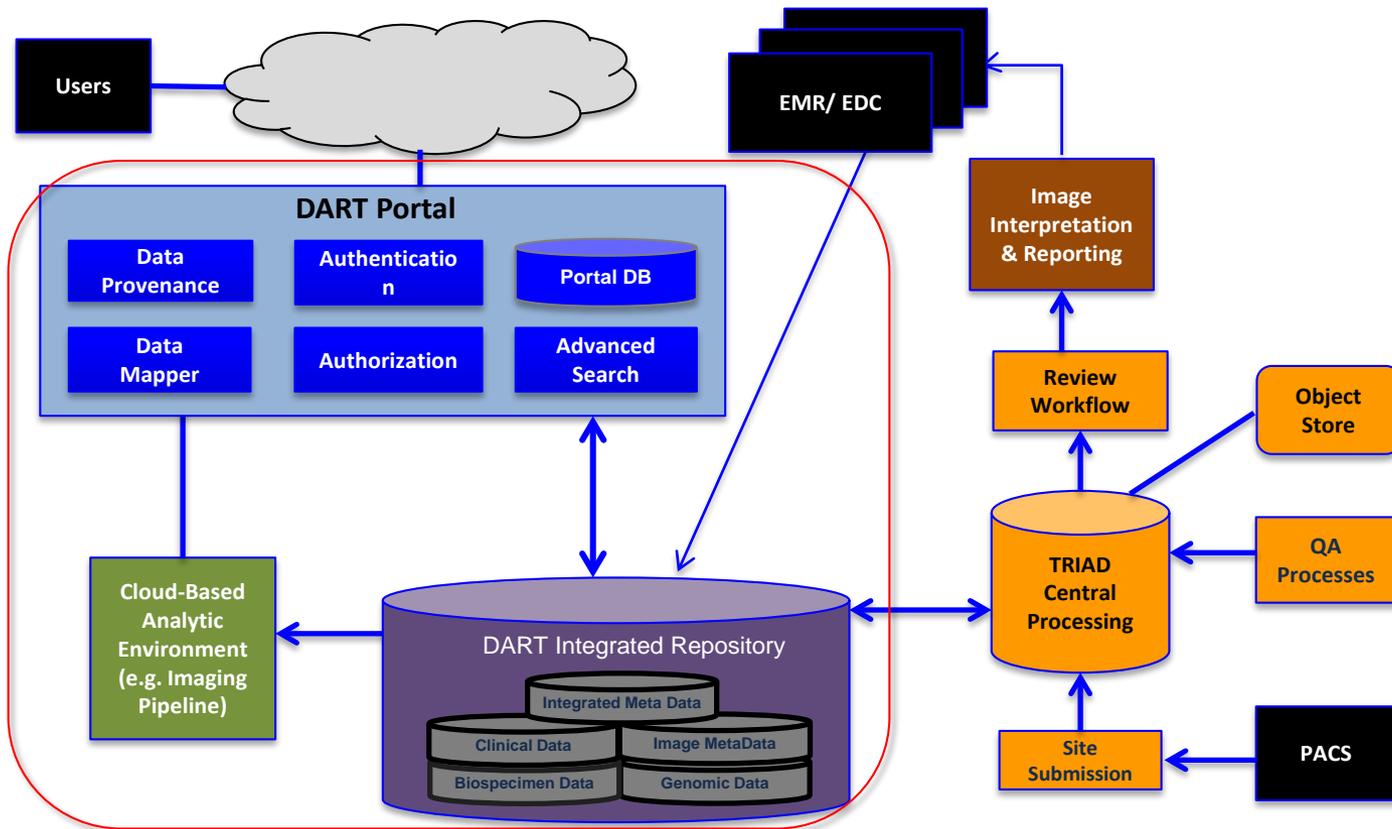
Example of Site Server Auto-Populating a Registry



ACRConnect



Data Ecosystem: TRIAD and DART



DART – Data discovery

The screenshot displays the ACR Data Archive & Research Toolkit (DART) interface. The top navigation bar includes the ACR logo, the title "Data Archive & Research Toolkit", and the DART logo. Below the navigation bar, the user is signed in as "adminweb1" and can click "Sign Out". The main interface is divided into several sections:

- Left Sidebar:** Contains navigation options such as "My Account", "BASIC SEARCH", "ADVANCED CLINICAL DATA SEARCH", "CROSS ARCHIVE IMAGING SEARCH", "DATA ANALYTICS", and "VIEW SAVED SEARCHES".
- Search Criteria:** Shows filters for "Project Parameters" (Project Name: 6654 - National Lung Screening Trial), "Demographics" (Ethnicity: Hispanic or Latino), and "DICOM Tags" (Manufacturer: GE Healthcare, etc.).
- Search Results Table:** A table with columns: ProjectID, ProjectName, StudyID, SiteName, Case ID, Subject Gender, Subject Age, Subject Race, Subject Ethnicity, and Imaging Data. The table lists several records for PET NSCLC studies.
- Data Analytics:** A section with a "SUBJECT" dropdown and "Export Datable to CSV" and "Save Study Numbers and C" buttons.
- Analytics Dashboard:**
 - STUDIES:** A pie chart showing the distribution of study types: Lung Screening Study (67%) and Breast Ultrasound (19%).
 - STUDIES Table:** A table with columns: Term, Count, and Action. It lists various study terms and their counts.
 - RECORDS BY DUE DATE:** A bar chart showing the number of records over time, with a peak around 2010-01.
 - NUMBER OF RECORDS PER CASE (TOP 5 SHOWN):** A table with columns: Term, Count, and Action. It lists the top 5 terms and their counts.

Imaging Pipeline and Advanced Analytics

The screenshot displays the DART web interface. The top navigation bar includes the ACR RADIOLOGY logo, the title "Data Archive & Research Toolkit", and the DART logo. Below the navigation bar, there are tabs for "DISCOVERY", "IMAGE PIPELINE", and "BUSINESS REPORTS". The main content area shows a grid of pipeline cards, with "ANTs Cortical Thickness" selected. The detailed view of this pipeline includes a description, a workflow diagram, input selection fields, and a results table.

ANTs Cortical Thickness

ANTs is a state-of-the-art medical image registration and segmentation toolkit. The volume-based ANTs cortical thickness pipeline produces a cortical thickness map from an individual subject's T1-weighted MRI. The pipeline includes all the necessary preprocessing steps consisting of well-validated algorithms for brain extraction, brain segmentation, template construction, and image normalization. More information about ANTs can be found at: <http://stnava.github.io/ANTs/>

Inputs: T1-weighted image, T2-weighted image (optional), brain template

```
graph LR; A[Input 1] --> B[ANTs Cortical Thickness]; C[Input 2] --> B; B --> D[Output];
```

Choose Input

Choose Image
D01002-Guys-0828-T1_slice90.nii.gz (2D)

Choose an Input Template
2D Template

Submit

Results

Pipeline Name	Date	Output Files
ANTsCorticalthickness	20151120161848	Download
ANTsCorticalthickness	20151201074403	Download
ANTsCorticalthickness	20151204144653	Download



thank you!