# CTC Workflow: Reviewing & Reporting Exams

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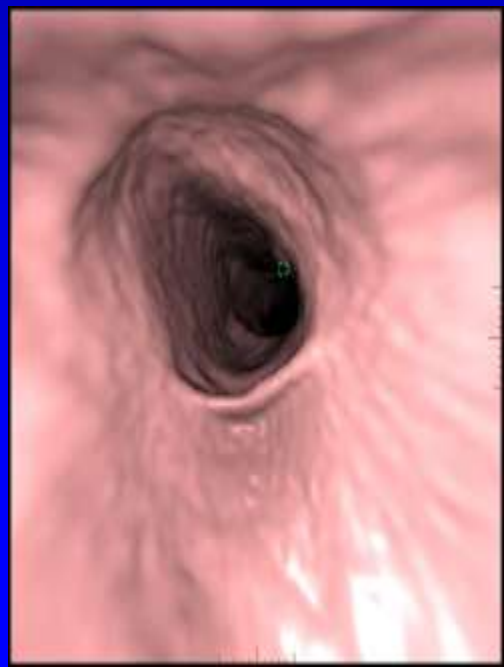
The University of Chicago

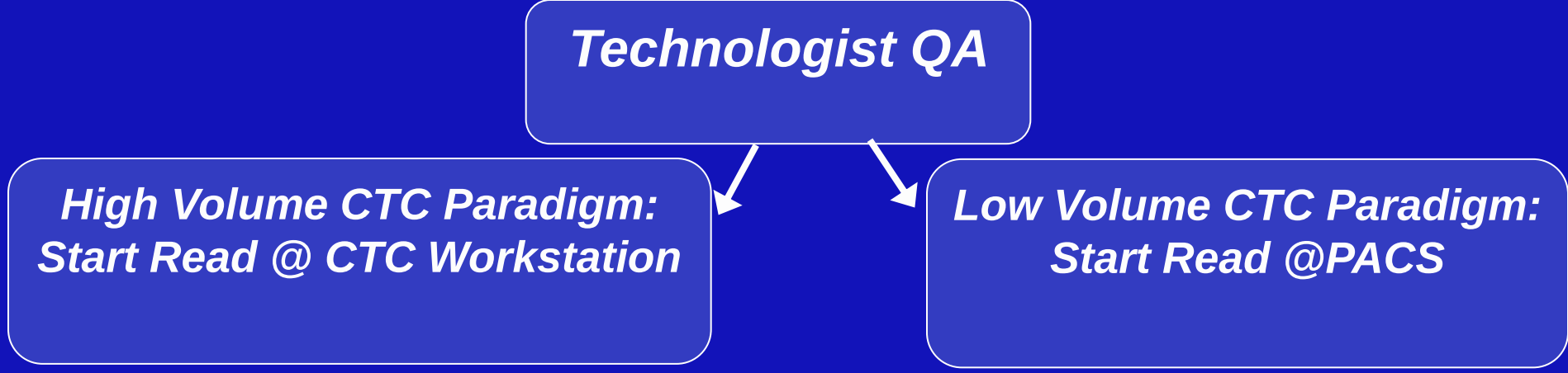


# Aims

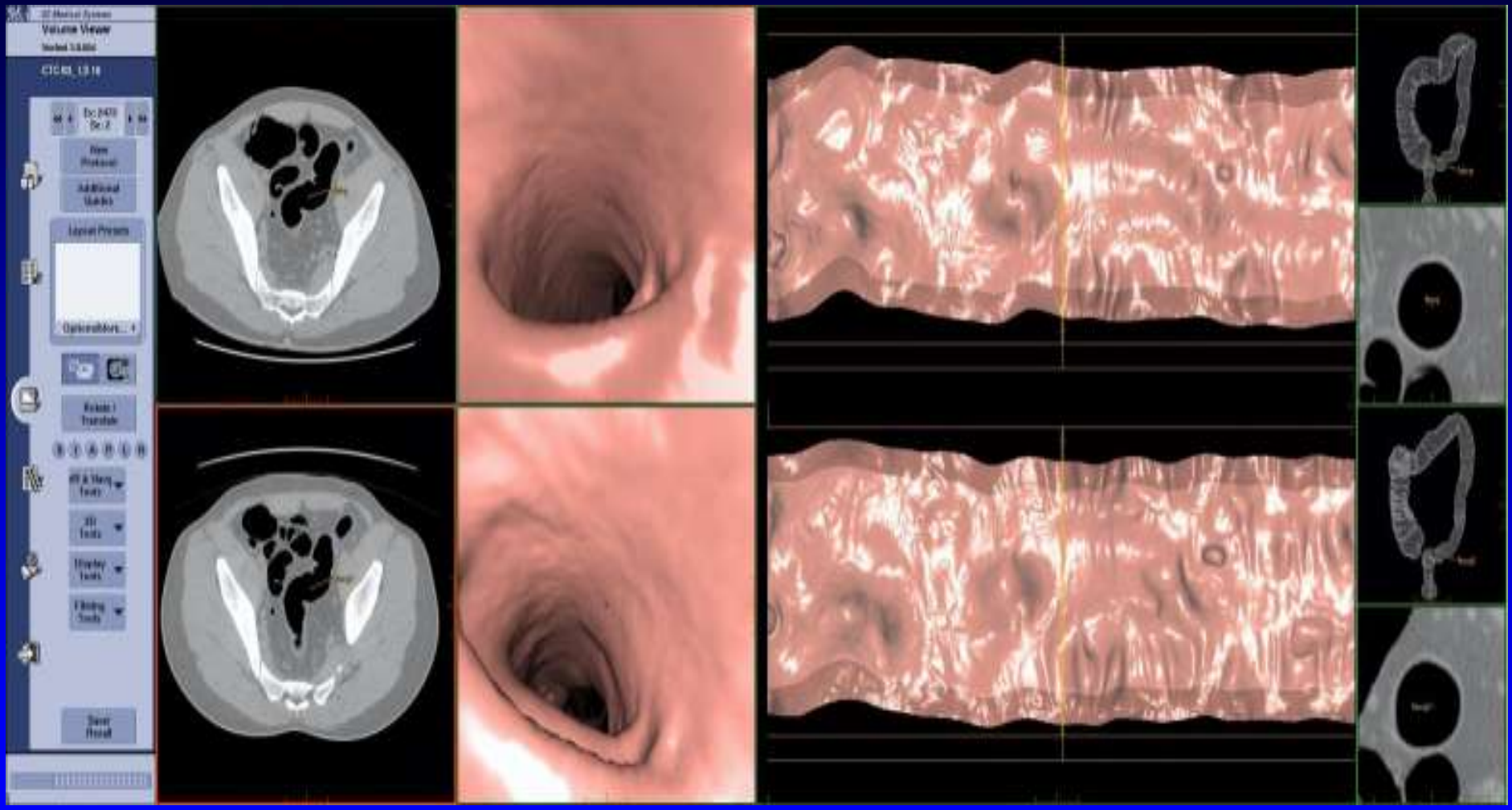
- Explain the workflow for CTC interpretation and reporting
  - Environment for Interpretation
  - Quality assurance
  - Common interpretation strategies
  - Generating a CTC report

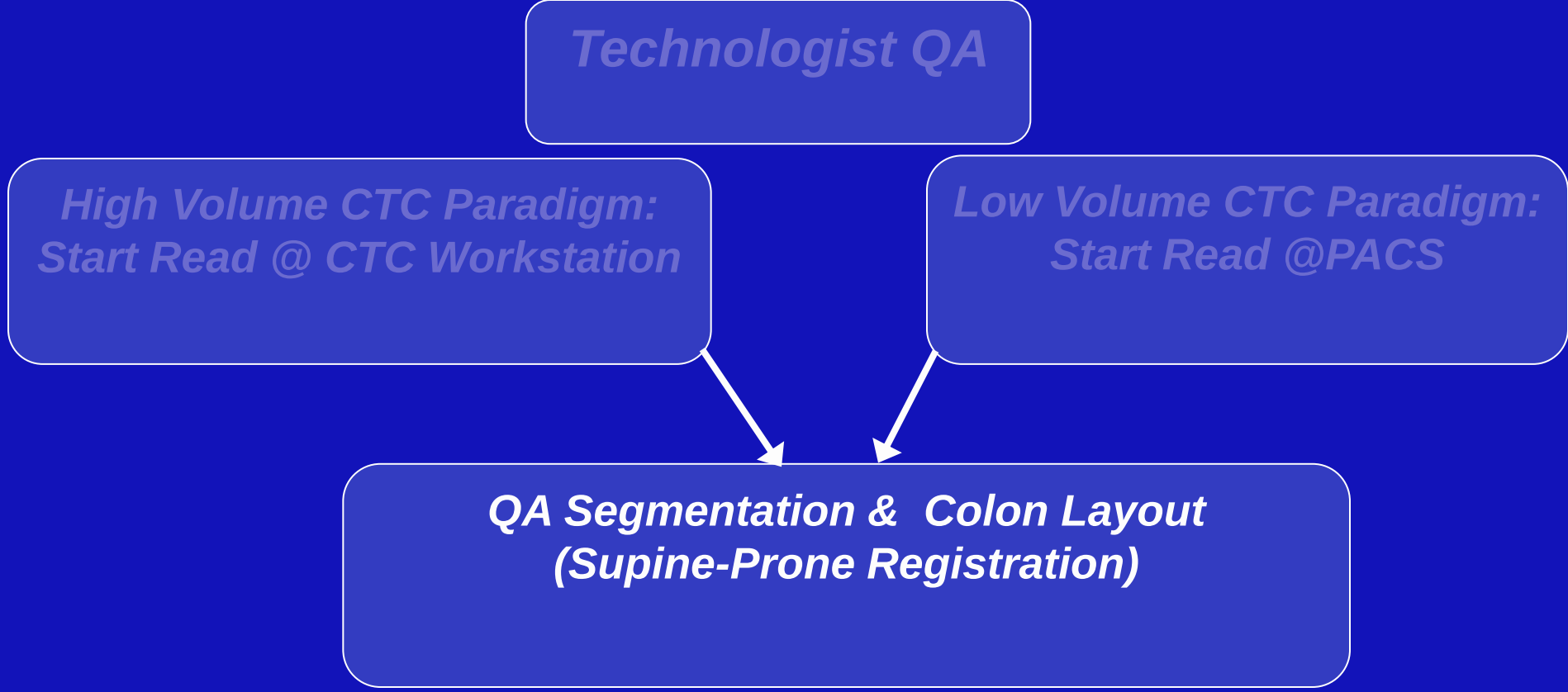
# Workflow of CTC Interpretation

- Confirm segmentation and map out colon
  - 3D transparency view or coronals
- Quality assurance
  - Distention, stool, fluid, tagging
- Search for polyps using both 3D *and* 2D
- Characterize and measure polyp candidates
- Secondary CAD-assisted evaluation
- Search for extracolonic findings
- Report (follow C-RADS guidelines)


Technologist QA
High Volume CTC Paradigm:
Start Read @ CTC Workstation
Low Volume CTC Paradigm:
Start Read @PACS

CT Colon
CT Colon
MM Reading
Archive results from current
Findings Navigator
Name
Value
Source
H
R
A
L
10cm


Volume Viewer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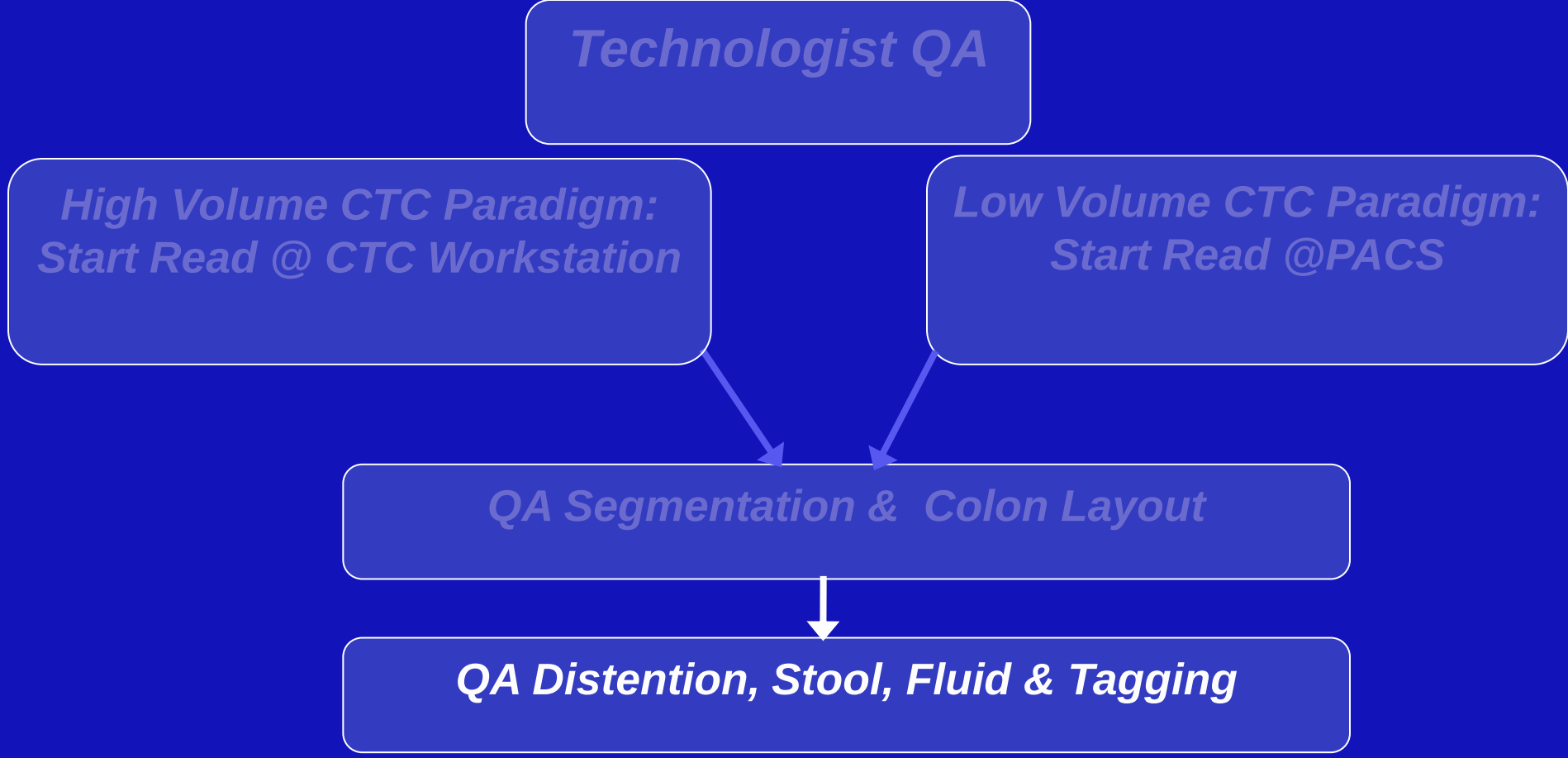
QA Segmentation & Colon Layout
(Supine-Prone Registration)

SUPINE

PRONE

# Supine-Prone Registration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## 3D View: Rapid QA of

- Location of segments
  - tortuosity
  - mobility when comparing supine to prone
- Identify ileocecal valve
- Quality of distention

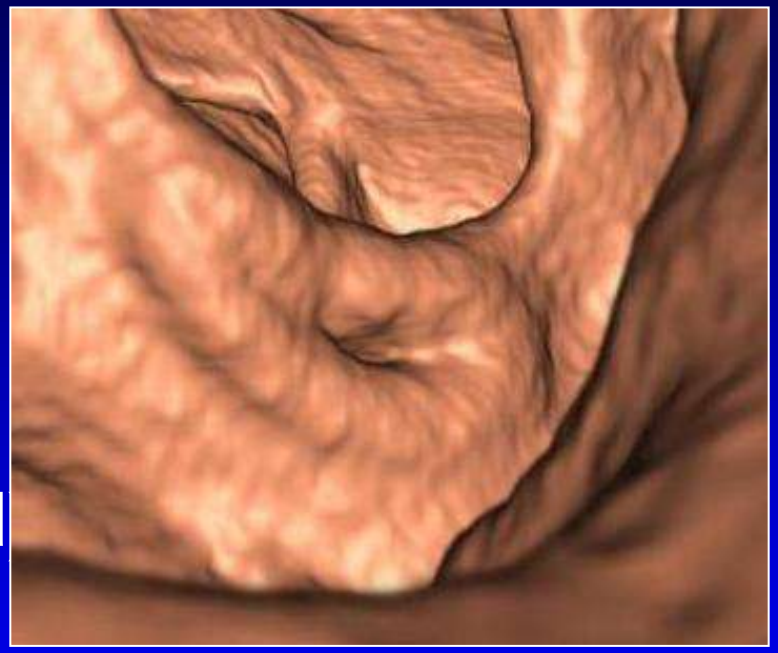
## 2D QA CHECKLIST

- Retained stool
  - size and tagging
- Retained fluid
  - quantity
  - location
  - tagging
  - change supine – prone
- Artifacts (e.g., metal, breathing)

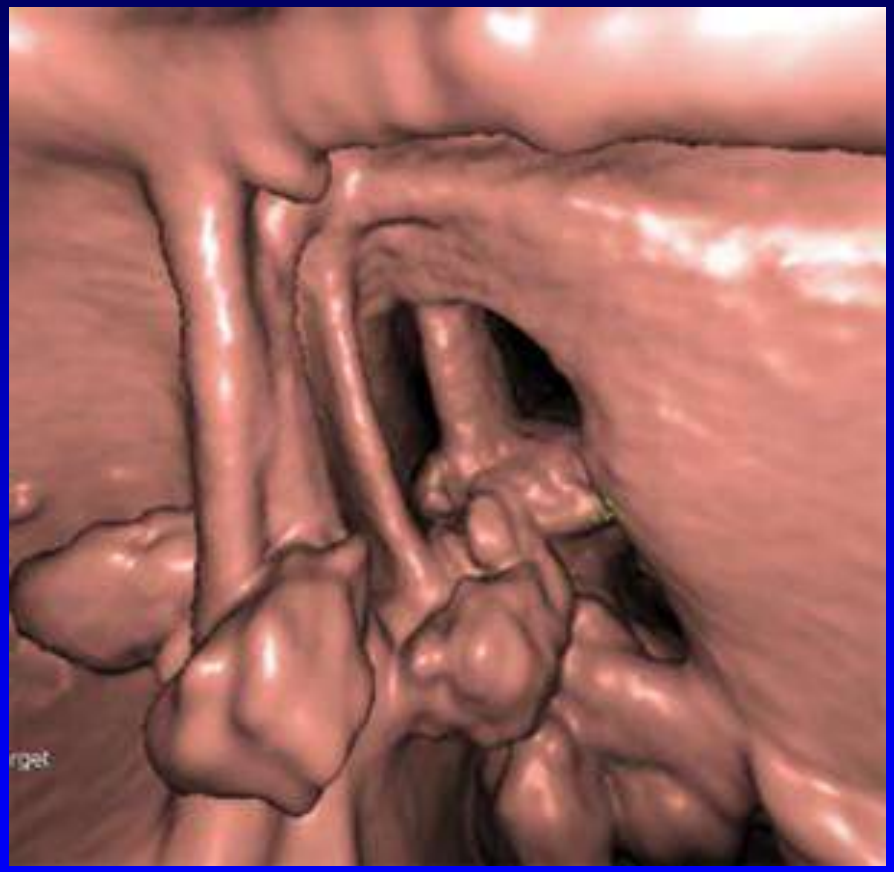
QA by technologist includes review of axial images for **distention:** most *critical* for diagnostic quality

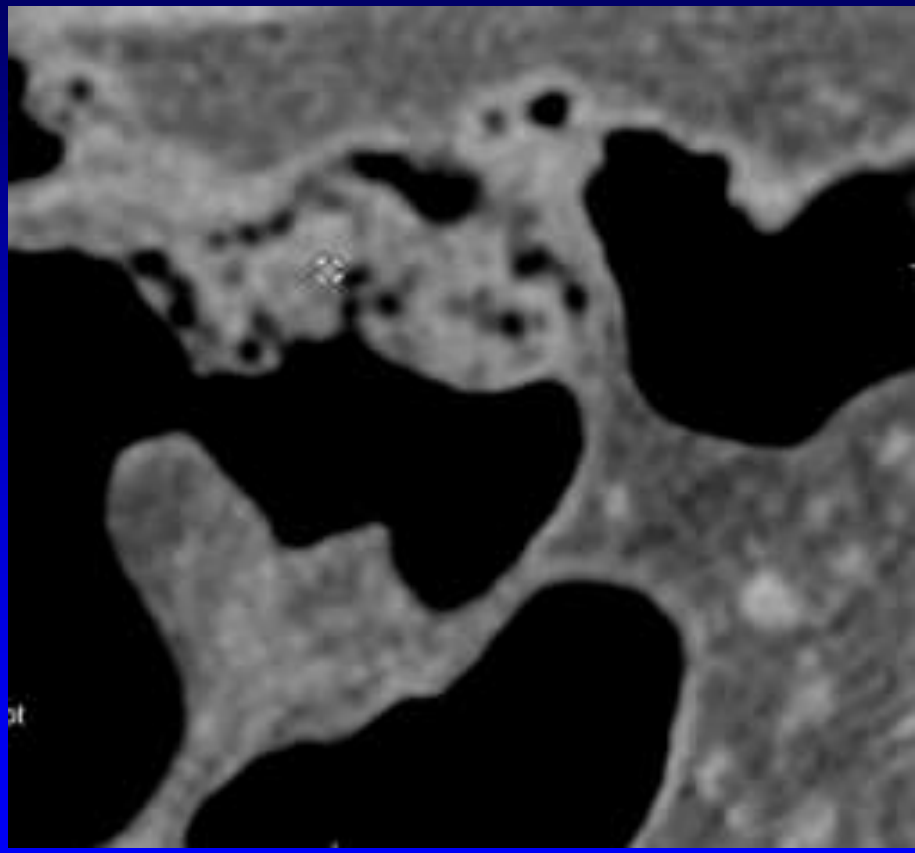
# You MUST identify the IC valve, but this is NOT always intuitive . . .

- Identify by:
  - Location
  - Fat
  - Shape
    - Papillary (dome-shaped)
    - Labial
    - Mixed



# Poor Preparation
# Excessive untagged feces





# Quality Assurance: The Bottom Line

- Are any segments obscured on both views?
- Could a 10 mm polyp be hidden?

# SAM Question:

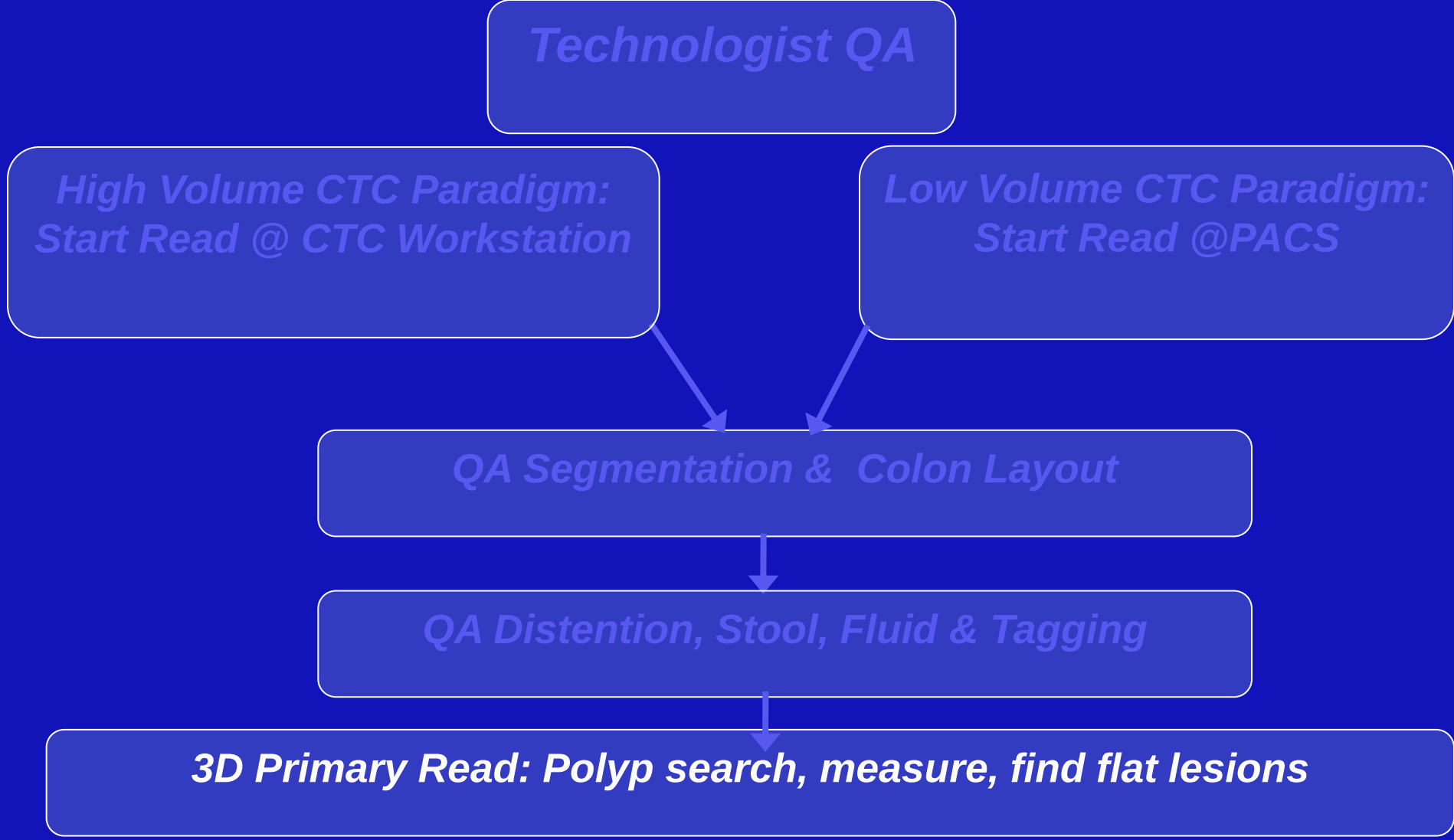
Intentionally Hidden for Handout

Response 1.

Response 2.

Response 3.

Response 4.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3D Primary Read: Polyp search, measure, find flat lesions

# Methods of Interpretation

- 3D with 2D problem solving
- 2D with 3D problem solving
- Soft tissue windows for flat lesions
- Bone windows for dense oral contrast tagged fluid and stool
- Virtual Pathology (open views)
- Computer-aided diagnosis (CAD)

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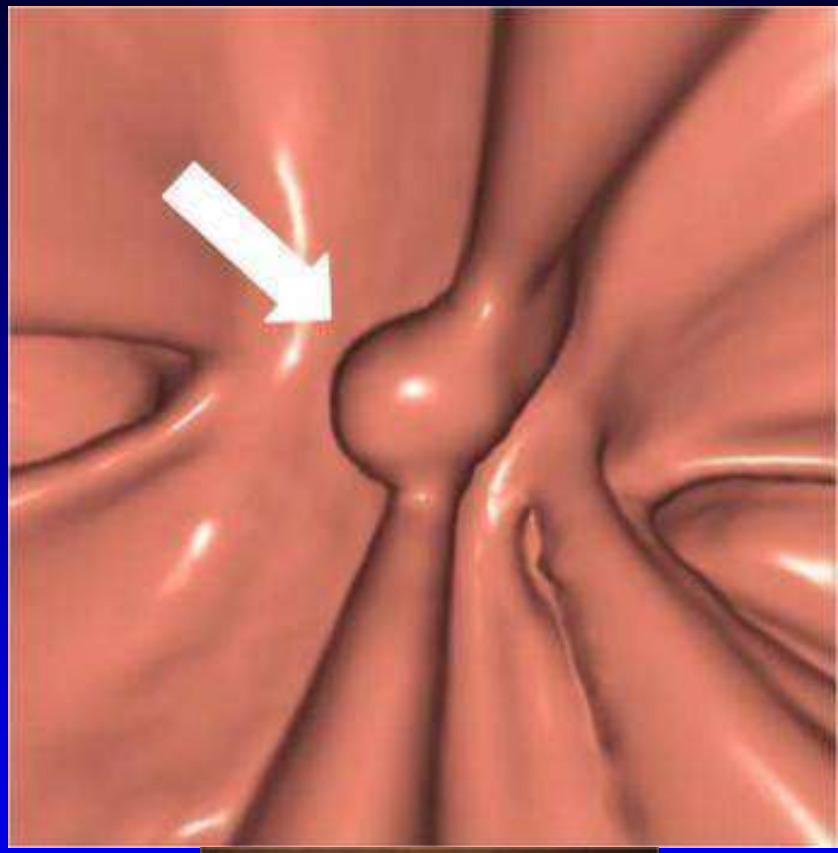
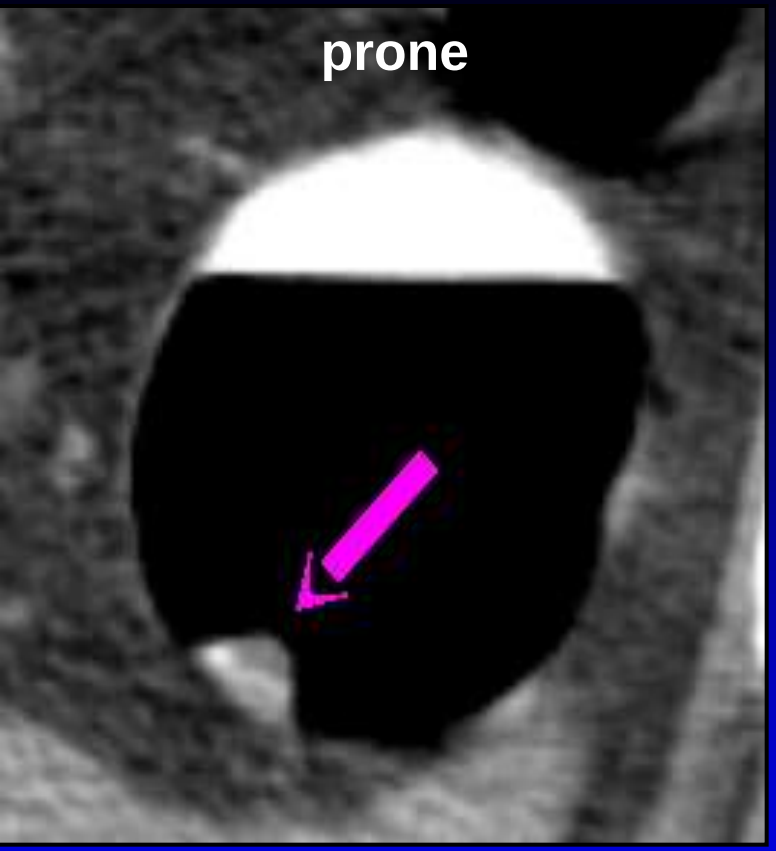
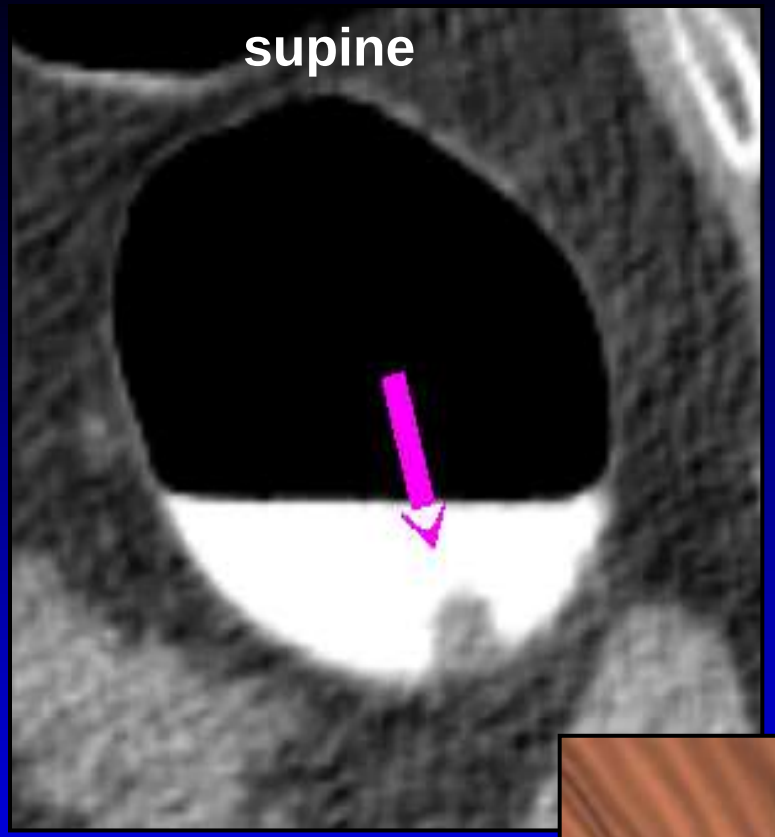
# Basic Feature of Polyps

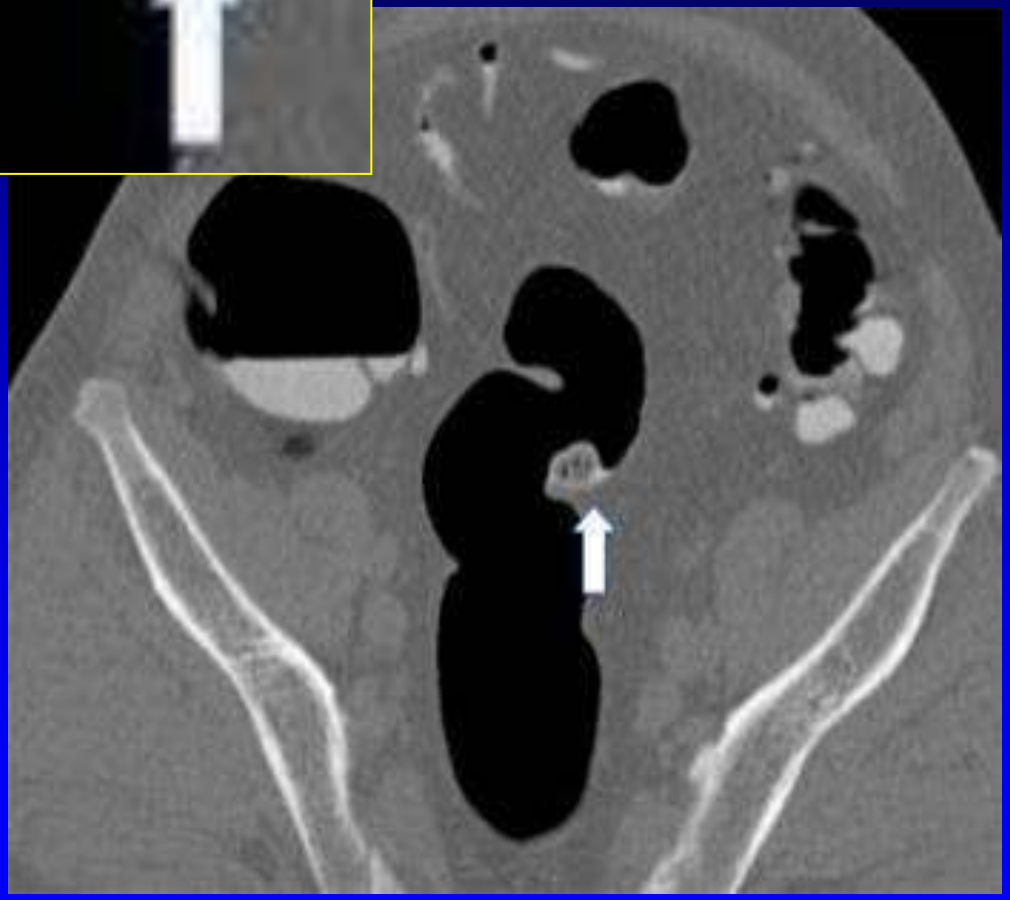


6 mm Polyp on a Fold
Coated with tagging agent


prone


supine

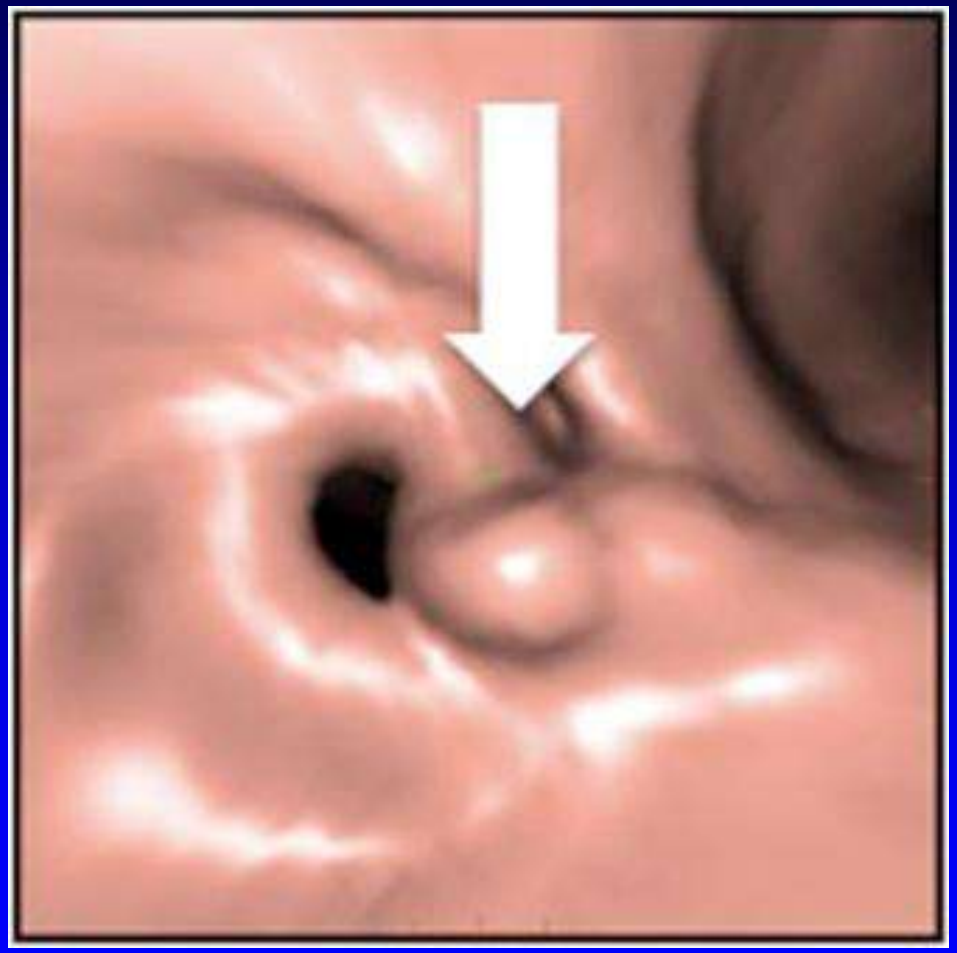
# Non-tagged Stool
# Mobile, With Internal Gas



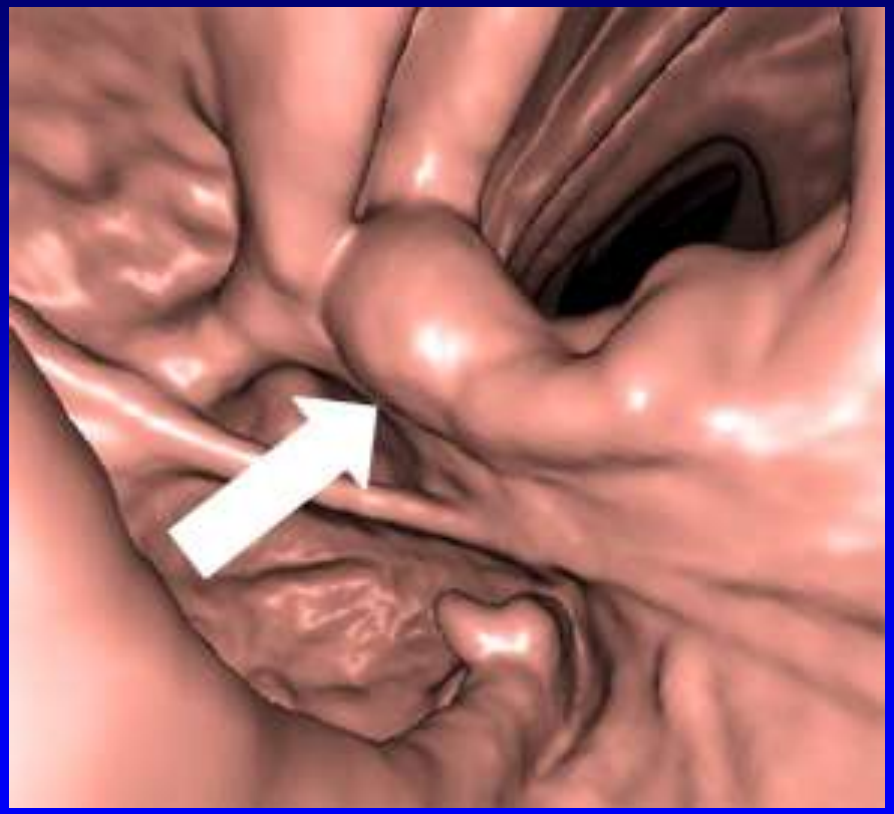
SUPINE

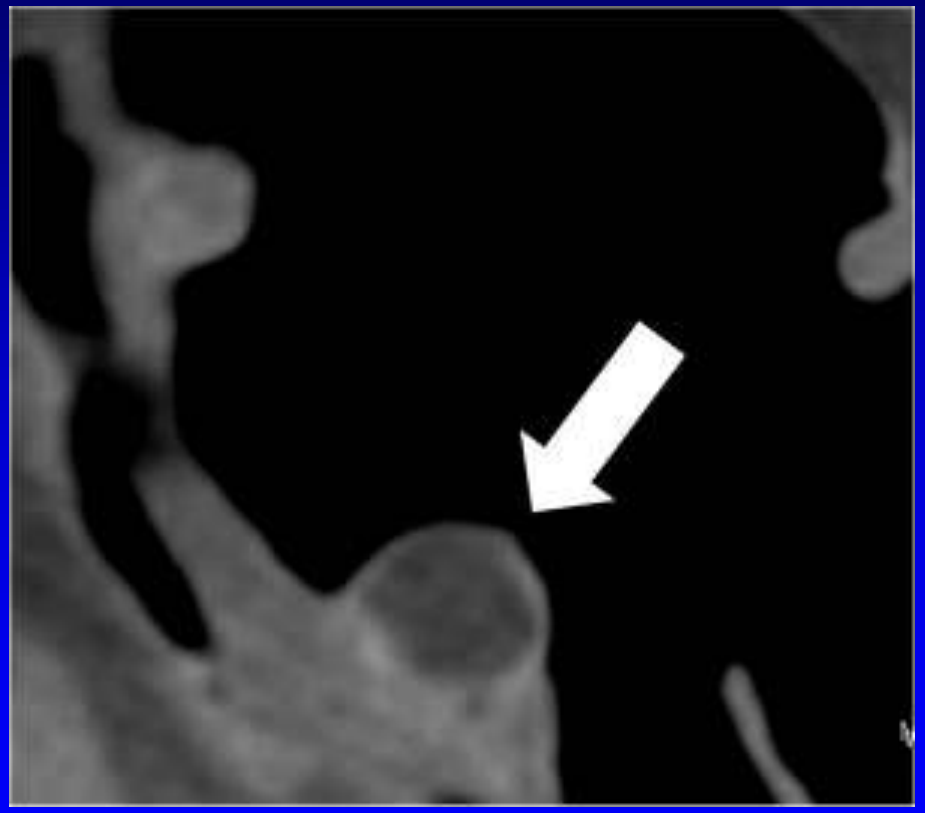
PRONE

# Well – Tagged Stool



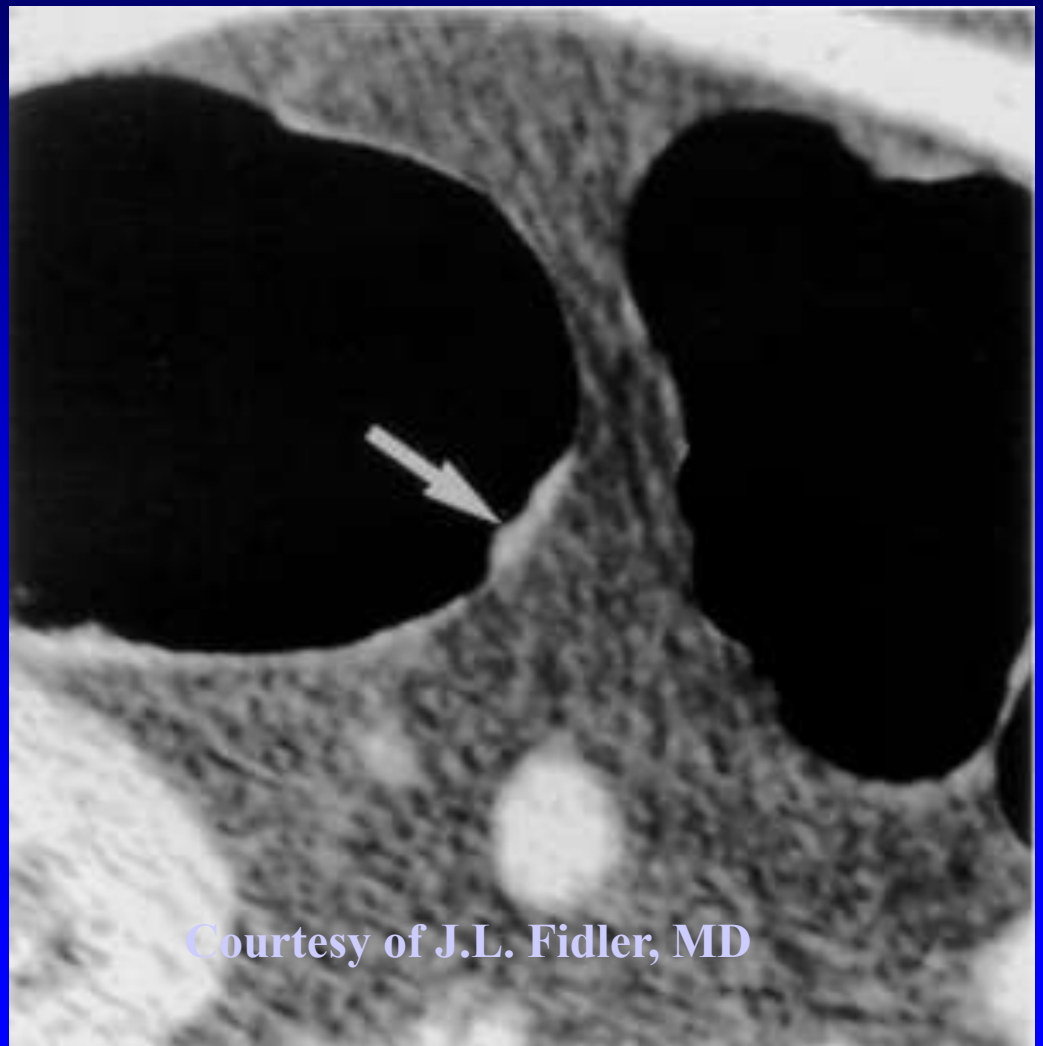
# Lipoma on the ICV





# Dedicated Read for Flat Lesions

## Wide Soft Tissue Window in 2D



Courtesy of J.L. Fidler, MD

Endoscopic view

# Approach to Polyp Candidate Analysis

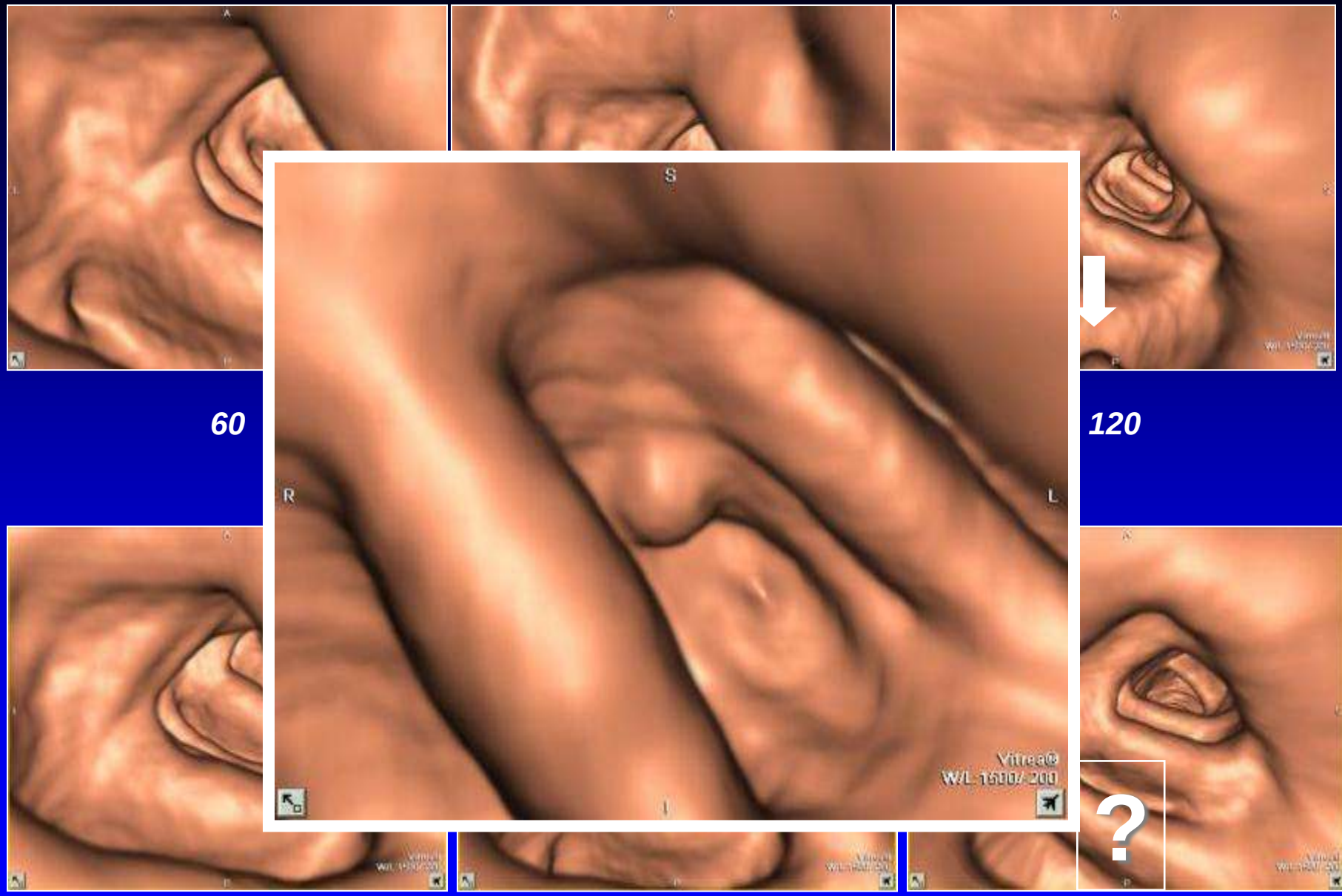
- Polyp vs. fold > use > 3D or MPRs
- Polyp vs. stool > use > texture (W/L or color map)
  - If solid . . .
    - Compare supine / prone for mobility
      - If mobile, check for long stalk, colonic rotation / flip

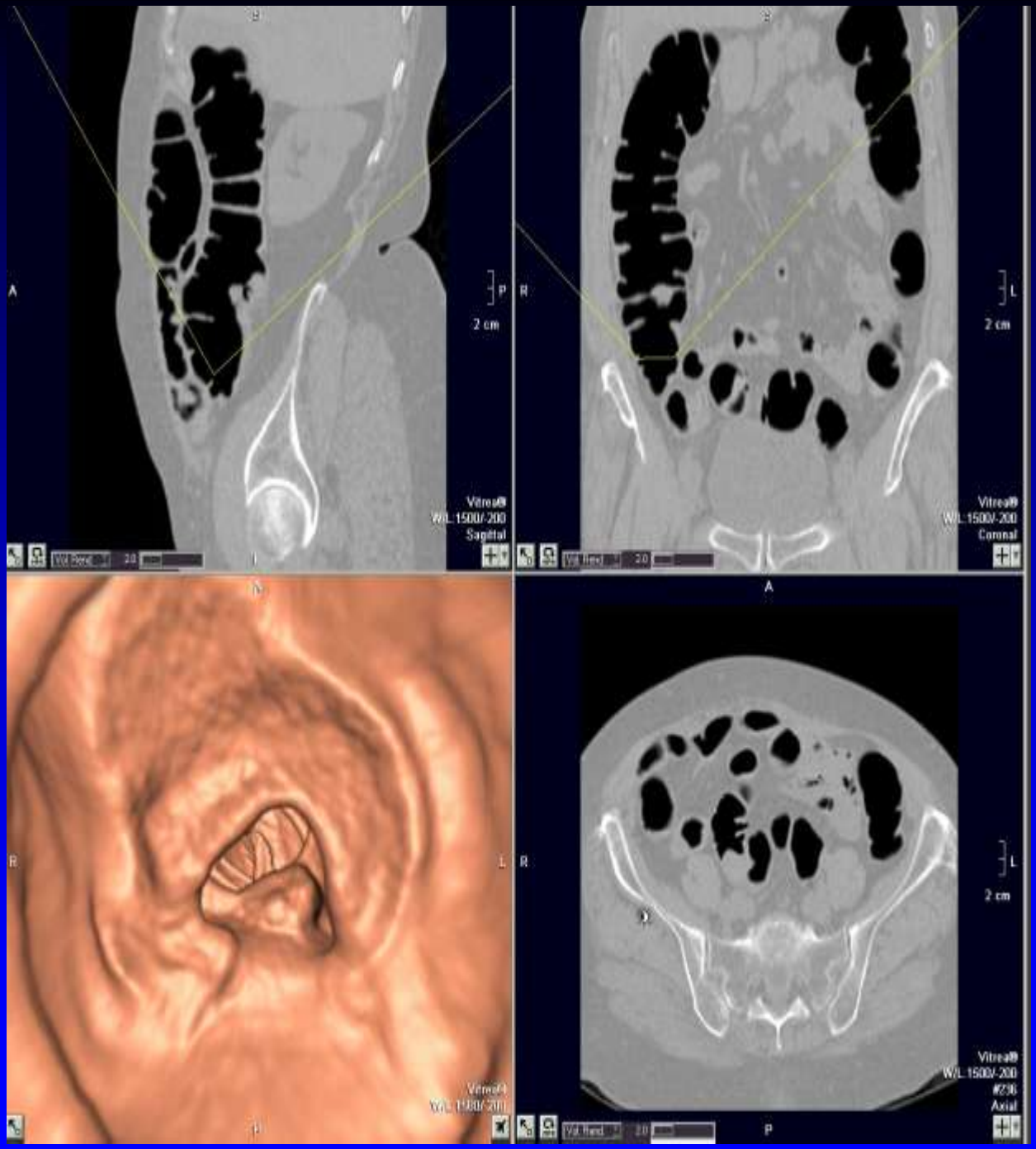
# Primary 3D Read Strategies

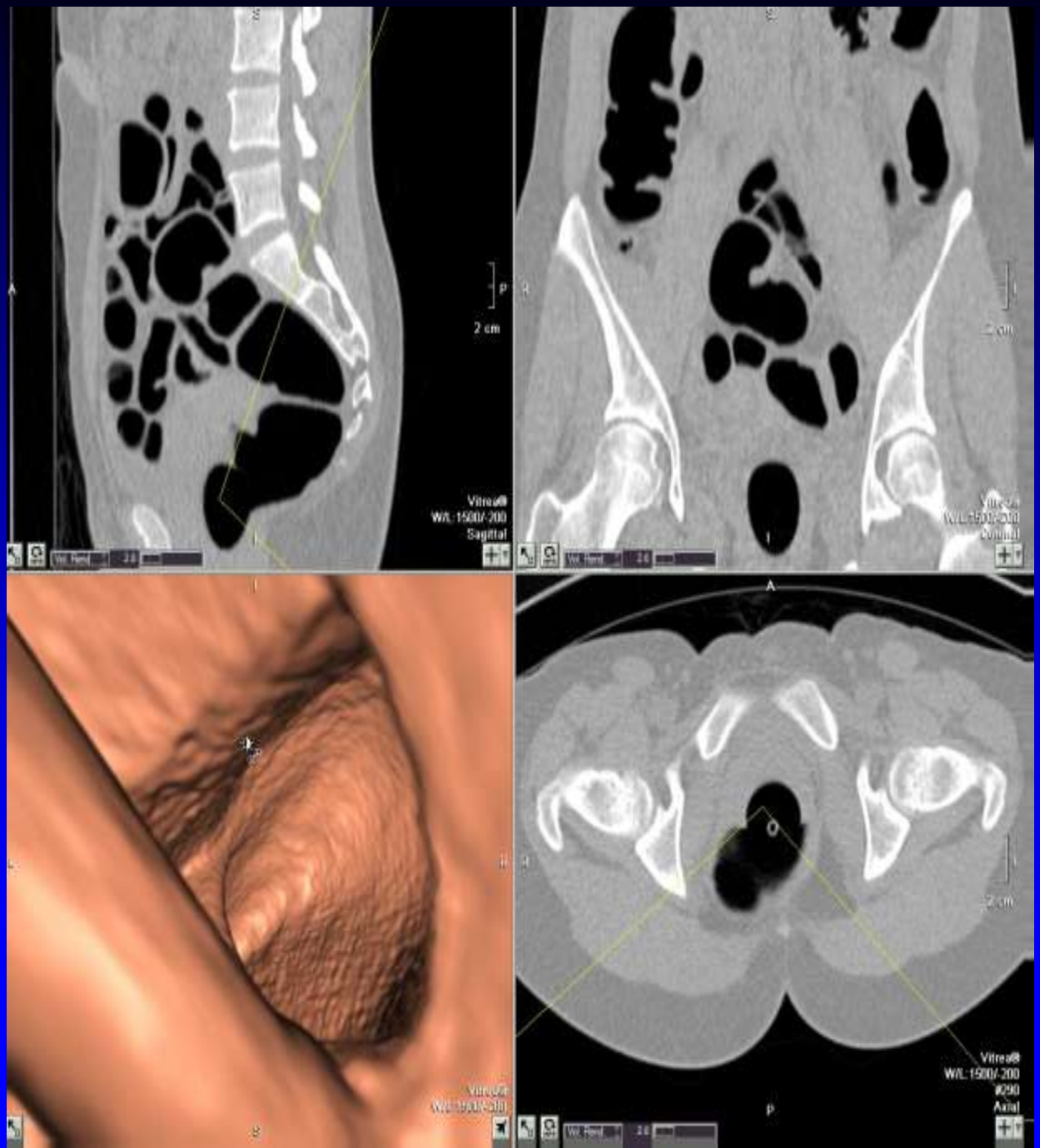
- Forward and backward
- Supine and prone
- Special software features (e.g., color map for polyp characterization, show blind areas)
- Problem solve in 2D as needed as you read
- Bookmark & defer difficult problem solving (e.g., difficult supine/prone comparison)

# Primary 2D Read
# Learn to “Track the Colon”

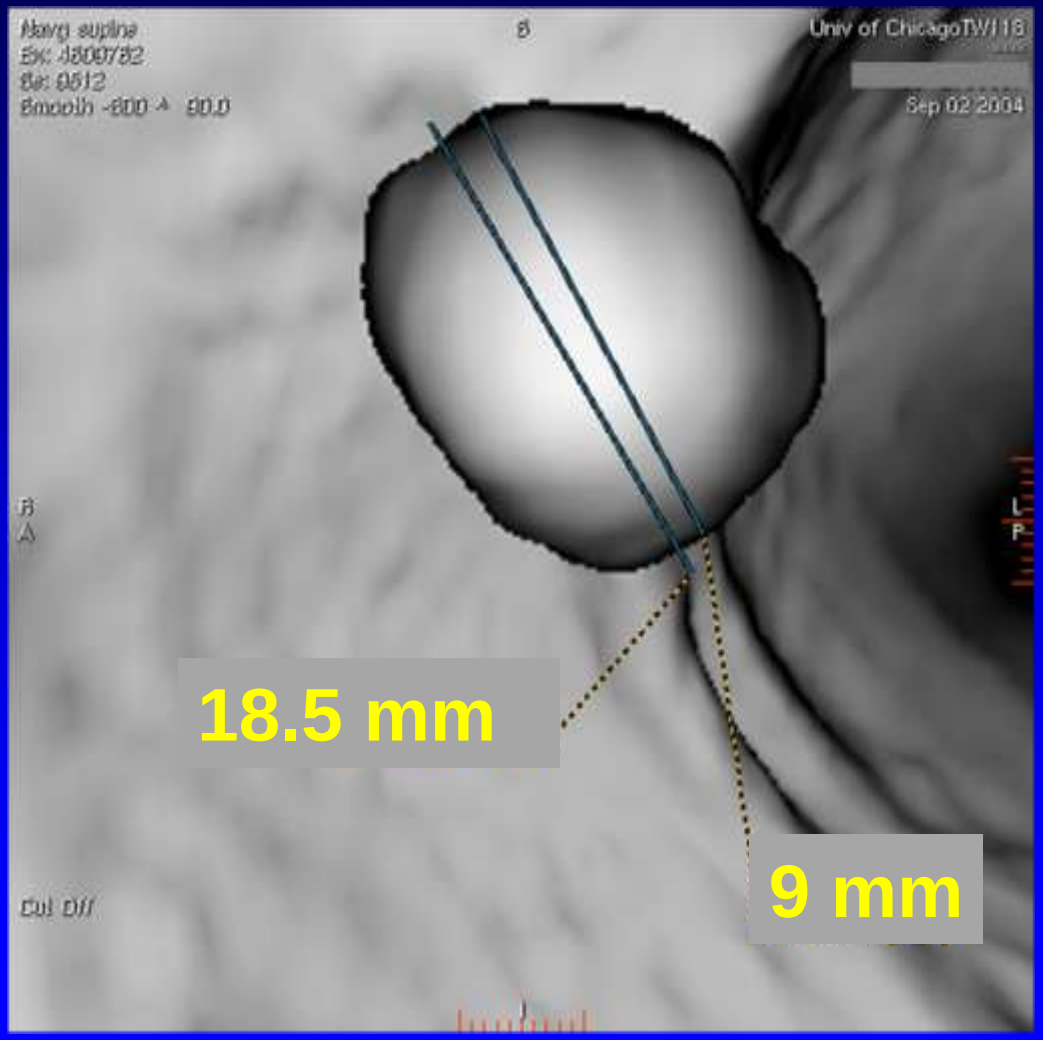
- Highly magnified axial
- Go slowly ! Look at all surfaces
- Evaluate very short segments as you move along an imaginary centerline
- Use a lung window (1500/-600) setting or “colon” (2000/0)
- Non-magnified or magnified MPR
- Simultaneous or deferred endoluminal comparison


S
R
L
I
?
60
120
60
90
120
Retrograde


A
P
2 cm
Vitrea®
W/L 1500/-200
Sagittal
R
L
2 cm
Vitrea®
W/L 1500/-200
Coronal
R
L
Vitrea®
W/L 1500/-200
R
L
A
P
2 cm
Vitrea®
W/L 1500/-200
#236
Axial

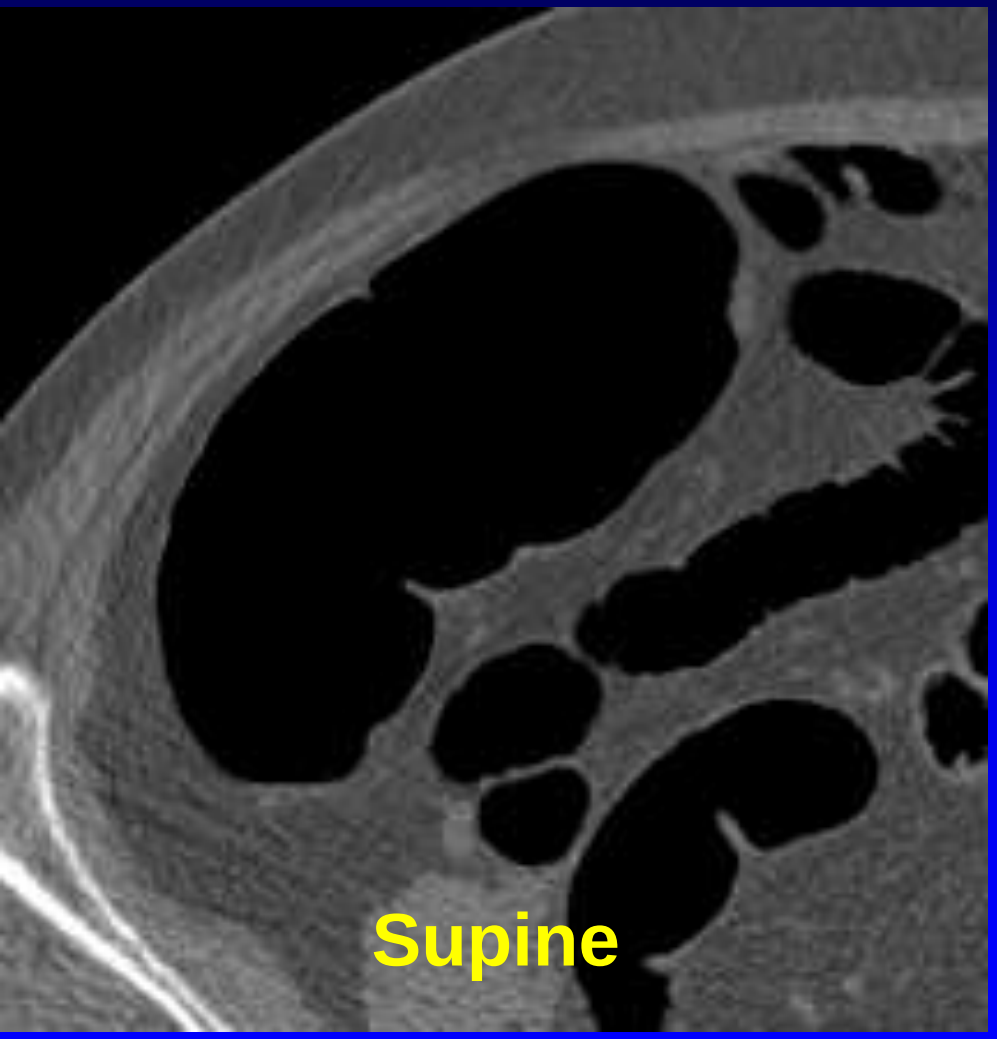

2 cm
Sagittal
2 cm
Axial

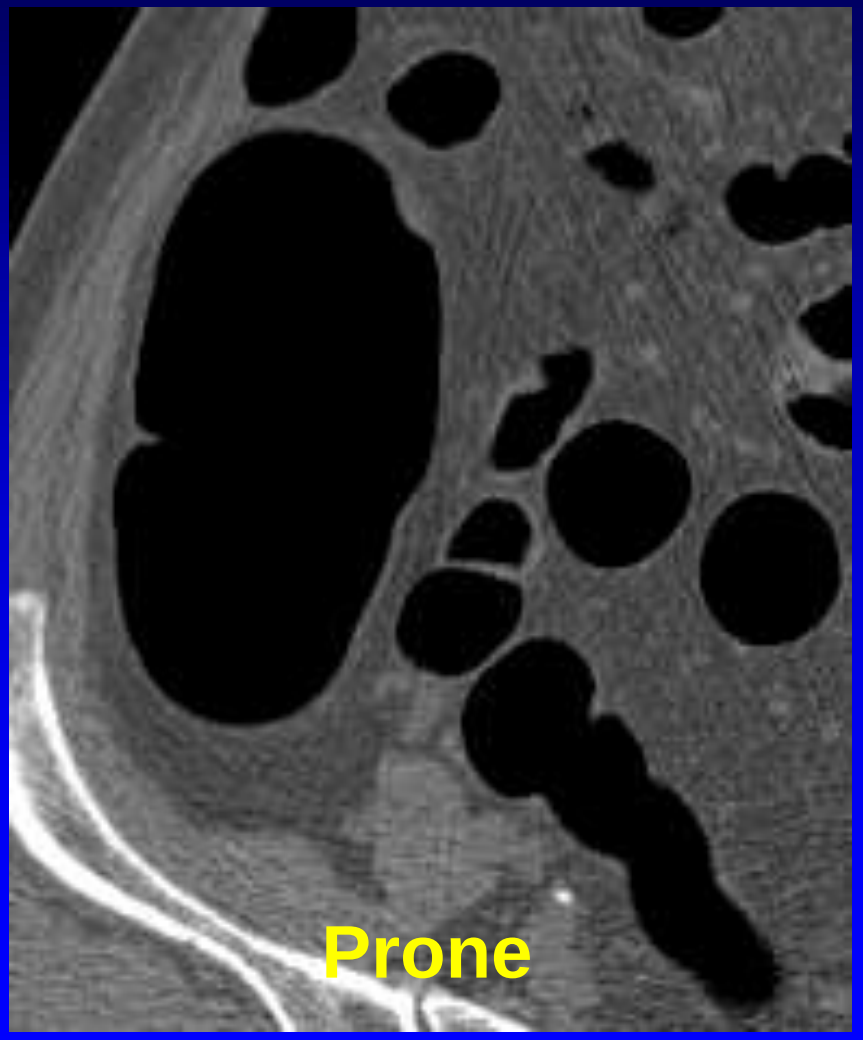
# 3D Over-measurement Pitfall
# “falling off the cliff”

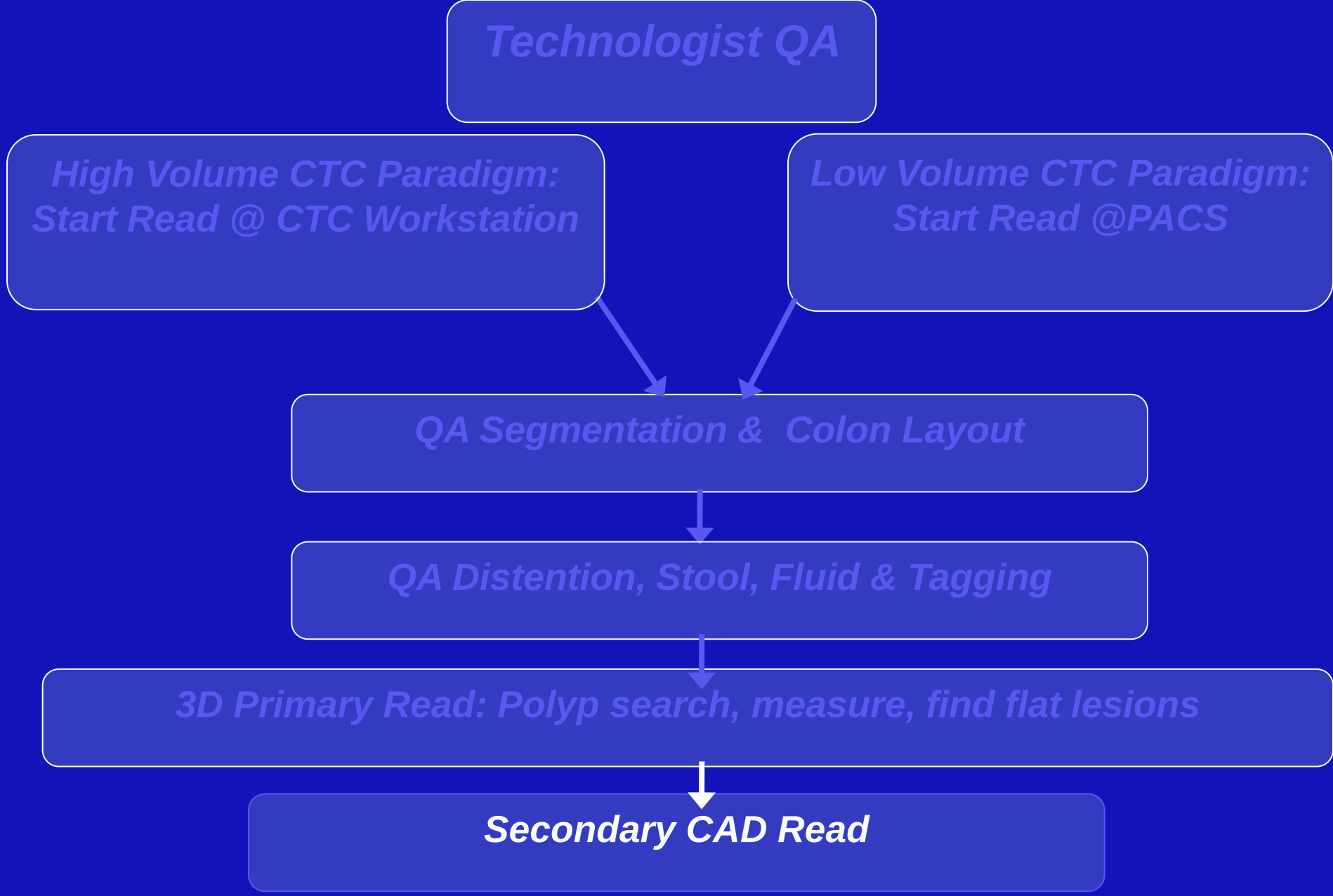



- Use largest dimension on either 2D or 3D to triage management
- Per “C-RADS” 6 mm threshold for reporting polyps

# Flat Lesions: Use Wide Soft Tissue Window

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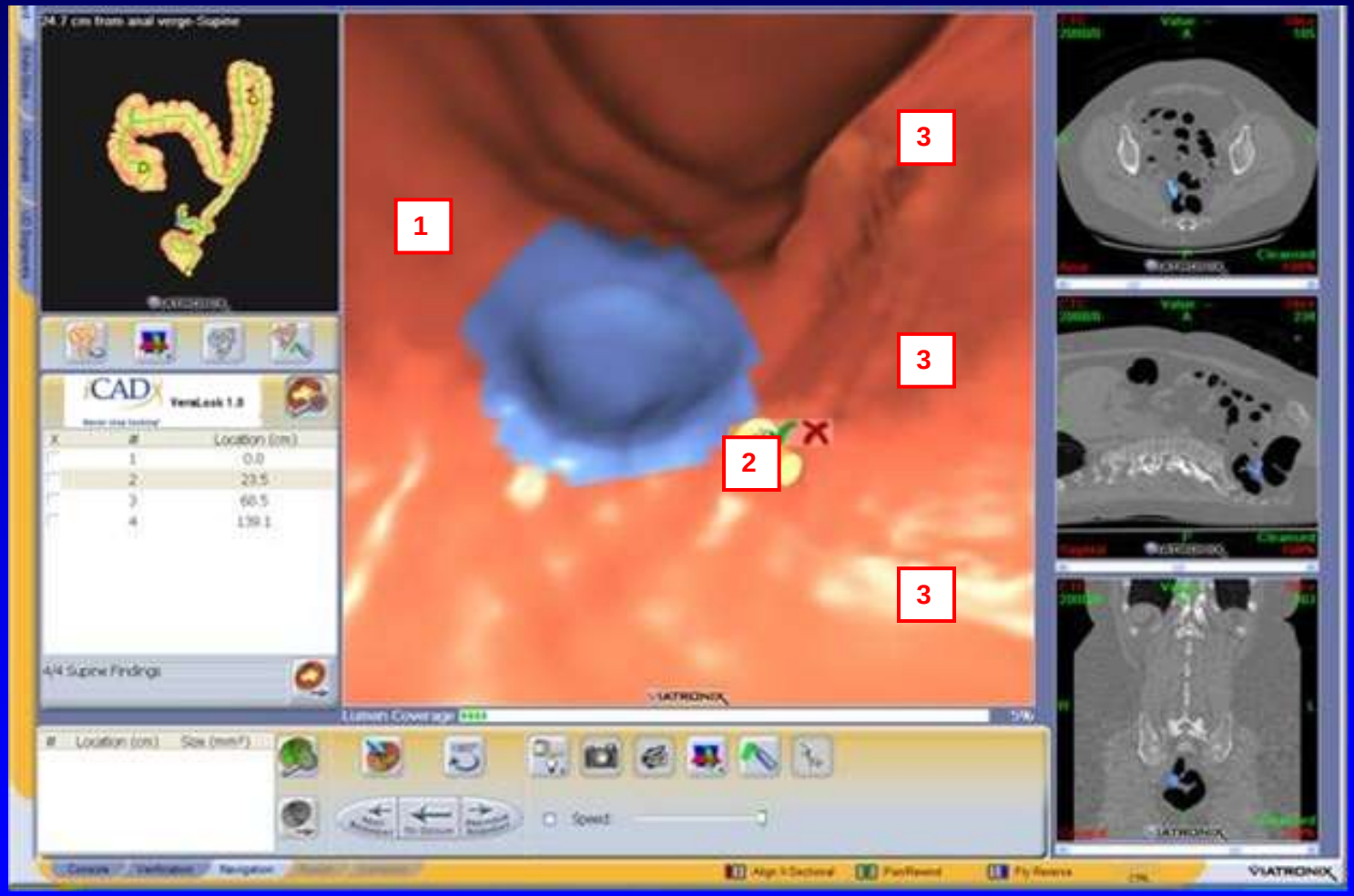
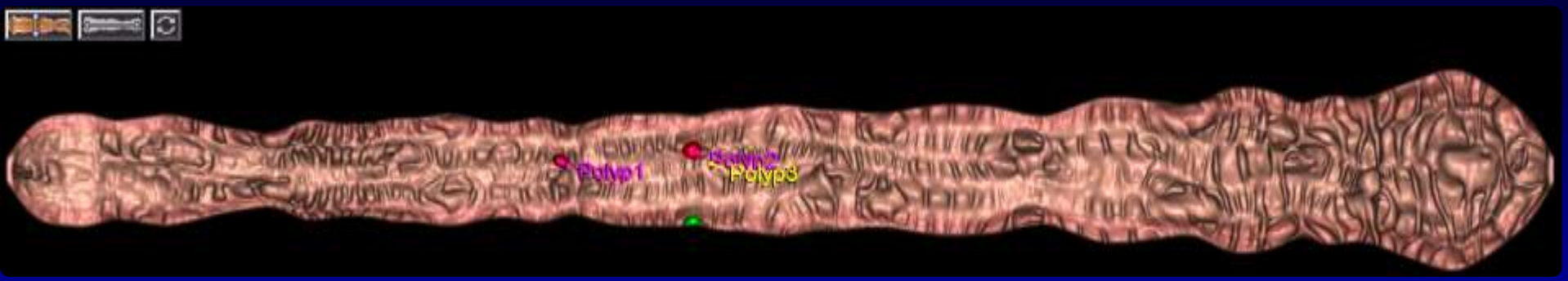
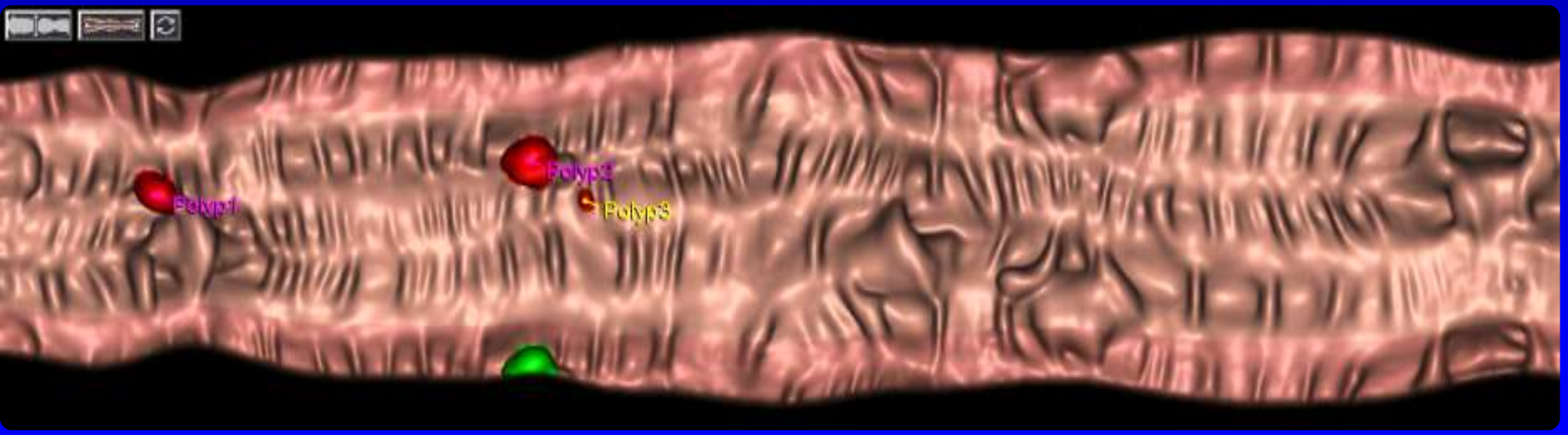
# Computer Aided Detection: Integrated Visualization Display

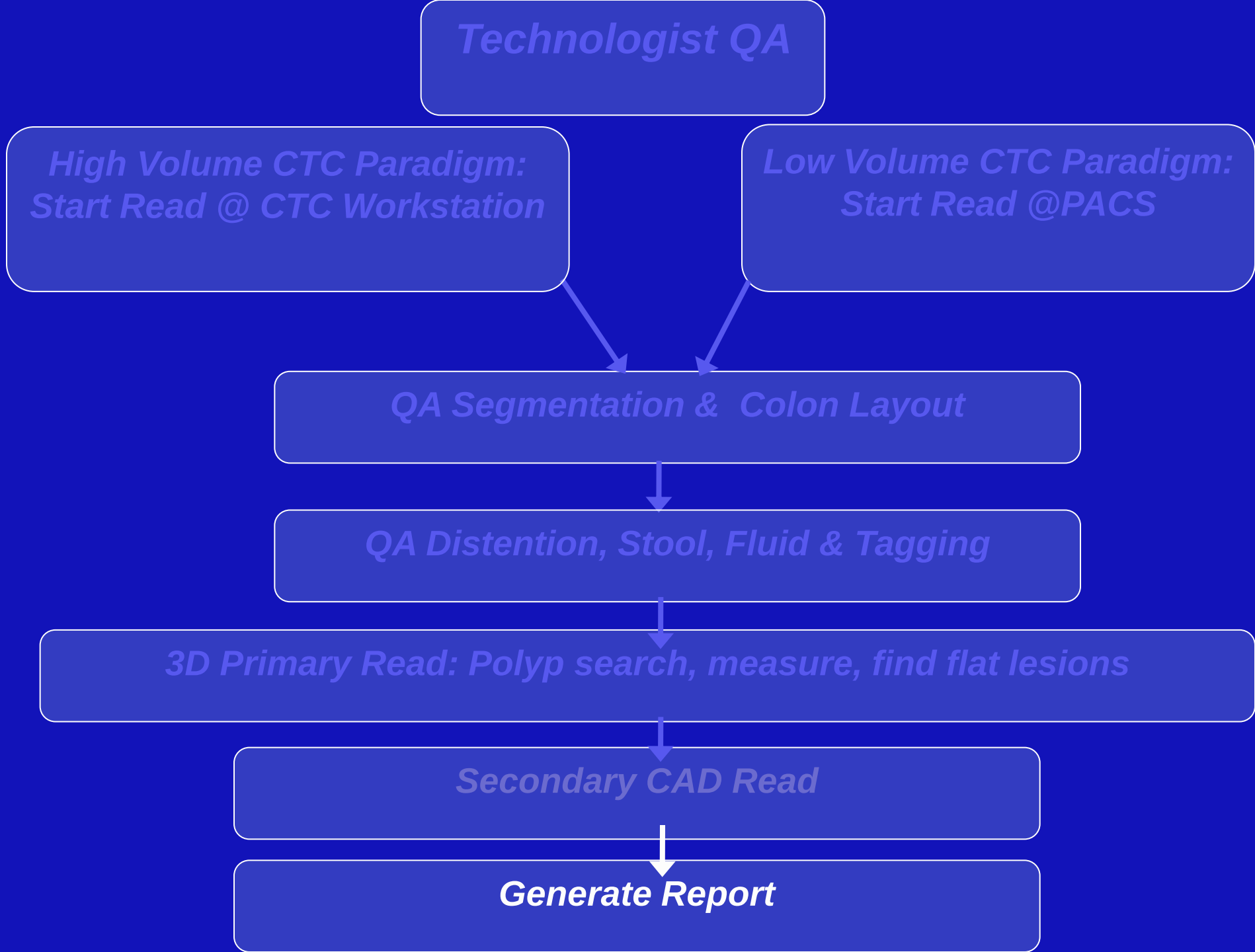


## Fit to Width




## Fit to Height

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Generate Report

# Structured CTC Reporting

- History
- Prep
- Informed of exam limitations
- Technique
- Colon findings
- Extracolonic findings
- C-RADS scores / Recommendations
- Footnote qualifier / reference C-RADS

# C-RADS Classification

- C0 Inadequate study (can not evaluate 10 mm lesions)
- C1 Normal, routine follow up (Q 5 yrs CTC)
- C2 Indeterminate; 1-3 yr f/u
  - Polyp 6-9 mm, $\leq$ 3 in number
  - Findings indeterminate; cannot exclude polyps $\geq$ 6 mm
- C3 10 mm or $\geq$3 6-9mm polyps → Colonoscopy
- C4 Mass, likely malignant; surgical consult

***Zalis et al for the Working Group on VC. Radiology 2005;236:3-9.***

# Sample Histories

**History: 55 year old male. CTC for colorectal cancer screening.**

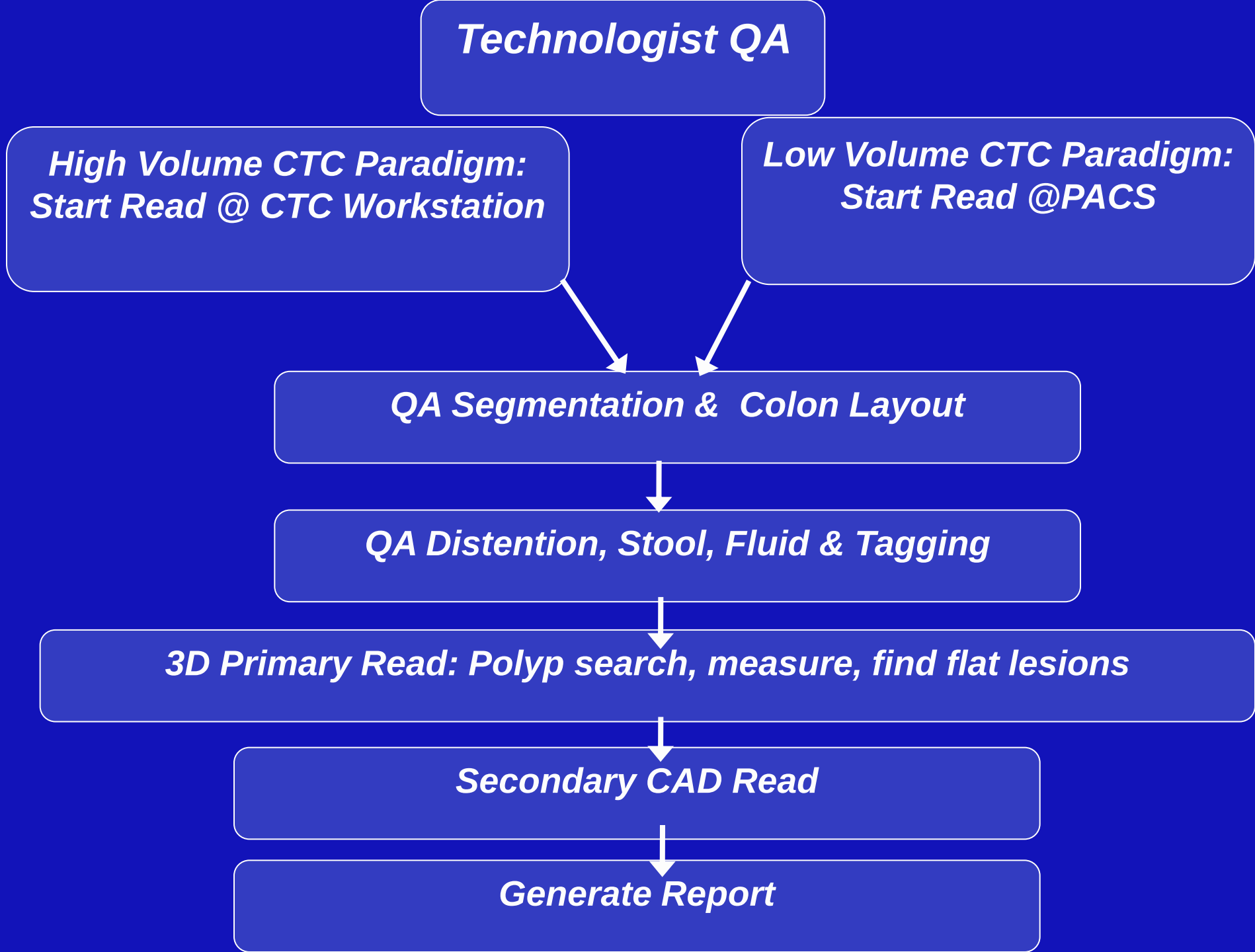
**History: 55 year old male. Anemia. Diagnostic CTC for colorectal cancer screening.**

**History: 55 year old male. History of incomplete colonoscopy in 2008. Asymptomatic. CTC for colorectal cancer screening.**

# Sample Report
# Findings 1st Paragraph

**Sample #1:The colon was well distended and cleansed. A small amount of residual fluid in the right colon and rectosigmoid was well-tagged with oral contrast.**

**Sample #2:The colon was well distended and cleansed except for particulate stool in right colon limiting sensitivity for small polyps. A moderate amount of residual fluid in the right colon and rectosigmoid was weakly tagged with oral contrast.**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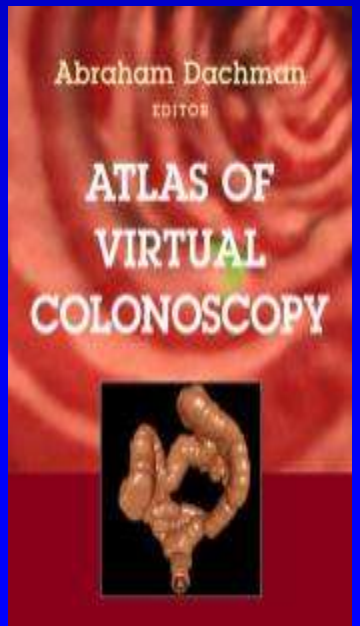
# THANK YOU !

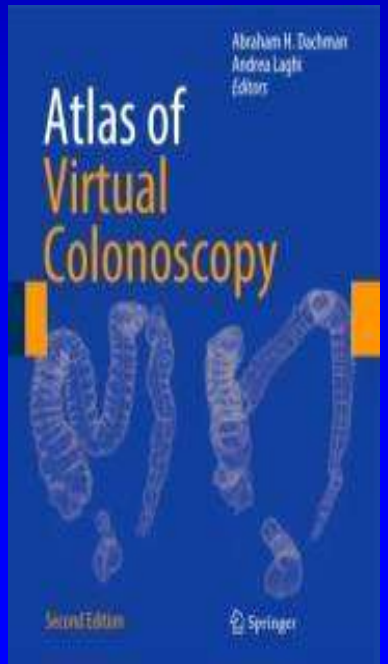
## Acknowledgments


- Contributors to “The Atlas of Virtual Colonoscopy” Eds1 & 2

*http://www.radiology.uchicago.edu/page/virtual-colonoscopy-overview*

*http://vctraining.uchicago.edu*



# Summary

- Both 2D and 3D skills are needed – use it in every case
- Use a systematic approach that involves QA of images, recognition of anatomic landmarks and supine-prone comparison
- Recognize pitfalls and use CAD secondary read
- Report using C-RADS guidelines and recommendations