Getting off the Radiology Treadmill: Cysts

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- No Disclosures

Objectives

- Review the current guidelines for cyst follow up
- Understand the limitations of radiology exams in characterizing cysts
- Review some common scenarios and apply recommendations

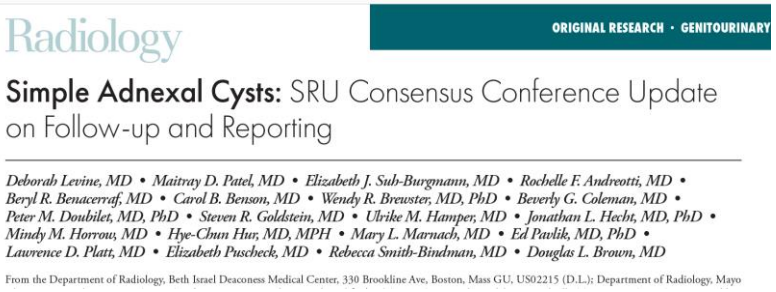
Top 10 Things Radiologists Wish Other Physicians Knew

1. Modern clinical radiology workflow has become complex
2. Radiologists only find out what they're looking for
3. Request forms with adequate clinical information are essential
4. We must promote direct communication
5. Patient Safety is a Priority
6. WE must decrease patient Radiation Exposure
7. WE must assure that what WE do is appropriate
8. The radiology report has become essential
9. Positive findings may need direct communication of results
10. **Incidental Findings have become a real epidemic**

Most Asked Questions

- Cyst follow up
  - Ovarian Cysts
  - Pancreatic Cysts
  - Renal cysts

References



Radiology

ORIGINAL RESEARCH • GENITOURINARY

Simple Adnexal Cysts: SRU Consensus Conference Update on Follow-up and Reporting

Deborah Levine, MD • Maitray D. Patel, MD • Elizabeth J. Suh-Burgmann, MD • Rochelle F. Andreotti, MD • Beryl R. Benacerraf, MD • Carol B. Benson, MD • Wendy R. Brewster, MD, PhD • Beverly G. Coleman, MD • Peter M. Doubilet, MD, PhD • Steven R. Goldstein, MD • Ulrike M. Hamper, MD • Jonathan L. Hecht, MD, PhD • Mindy M. Horrow, MD • Hye-Chun Hur, MD, MPH • Mary L. Marnach, MD • Ed Pavlik, MD, PhD • Lawrence D. Platt, MD • Elizabeth Puscheck, MD • Rebecca Smith-Bindman, MD • Douglas L. Brown, MD

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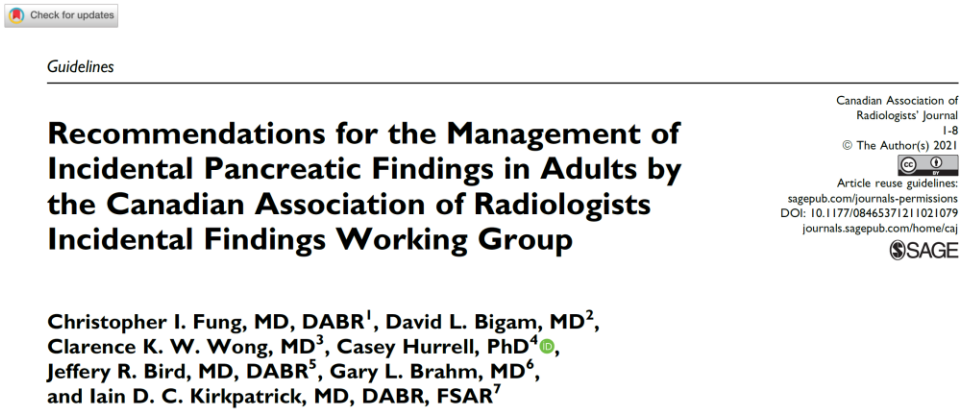

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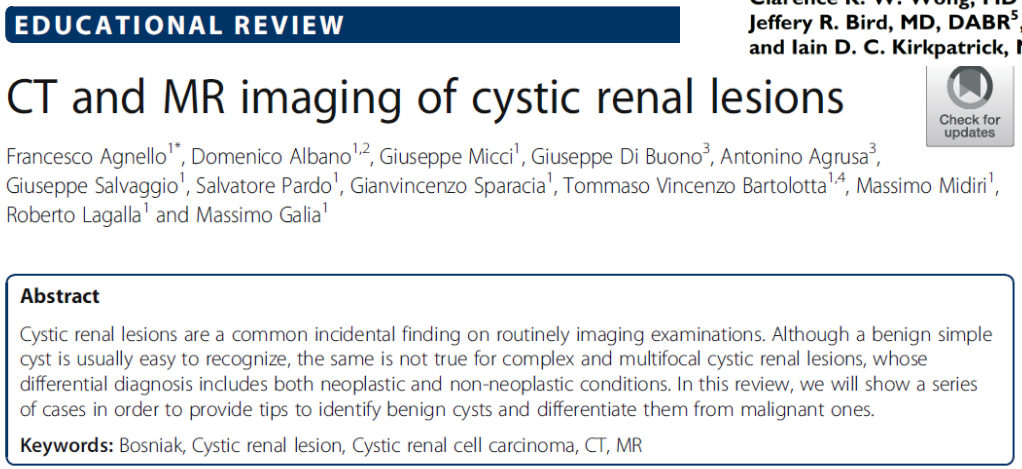
Recommendations for the Management of Incidental Pancreatic Findings in Adults by the Canadian Association of Radiologists Incidental Findings Working Group

Christopher I. Fung, MD, DABR[1], David L. Bigam, MD[2], Clarence K. W. Wong, MD[3], Casey Hurrell, PhD[4], Jeffery R. Bird, MD, DABR[5], Gary L. Brahm, MD[6], and Iain D. C. Kirkpatrick, MD, DABR, FSAR[7]



EDUCATIONAL REVIEW

CT and MR imaging of cystic renal lesions

Check for updates

Francesco Agnello[1*], Domenico Albano[1,2], Giuseppe Micci[1], Giuseppe Di Buono[3], Antonino Agrusa[3], Giuseppe Salvaggio[1], Salvatore Pardo[1], Gianvincenzo Sparacia[1], Tommaso Vincenzo Bartolotta[1,4], Massimo Midiri[1], Roberto Lagalla[1] and Massimo Galia[1]

Abstract

Cystic renal lesions are a common incidental finding on routinely imaging examinations. Although a benign simple cyst is usually easy to recognize, the same is not true for complex and multifocal cystic renal lesions, whose differential diagnosis includes both neoplastic and non-neoplastic conditions. In this review, we will show a series of cases in order to provide tips to identify benign cysts and differentiate them from malignant ones.

Keywords: Bosniak, Cystic renal lesion, Cystic renal cell carcinoma, CT, MR

Adnexal (Ovarian) Cysts

- Society of Radiologists in Ultrasound (SRU)
  - Define characteristics of benign adnexal cysts to decrease imaging FU and surgical evaluation
  - Multidisciplinary consensus conference
    - Gynecologists, radiologists, surgeons, pathologists
  - recommendations NOT for high risk
- Since guidelines published in 2010
  - Multiple studies showed no increased risk of malignancy when simple cyst IRRESPECTIVE of cyst size
- 2019
  - Updated recommendations

Smith-Bindman R, Poder L, Johnson E, Miglioretti DL. Risk of Malignant Ovarian Cancer Based on Ultrasonography Findings in a Large Unselected Population. JAMA Intern Med 2019;179(1):71–77.

Greenlee RT, Kessel B, Williams CR, et al. Prevalence, incidence, and natural history of simple ovarian cysts among women 55 years old in a large cancer screening trial. Am J Obstet Gynecol 2010;202(4):373.e1–373.e9.

Sharma A, Gentry-Maharaj A, Burnell M, et al. Assessing the malignant potential of ovarian inclusion cysts in postmenopausal women within the UK Collaborative Trial of Ovarian Cancer Screening (UKCTOCS): a prospective cohort study. BJOG

Ovarian Cancer

- Invasive serous cystadenocarcinomas
  - 25% of serous tumors
  - commonest malignant ovarian tumor
    - originate from the fallopian tube rather than the ovary

Cyst Characteristics

- Simple cyst
- Can be fully evaluated
  - Anechoic fluid collection
  - Smooth thin walls
  - No solid component
  - No septation
  - No internal flow
- Size
  - Largest diameter

Patient Characteristics

- Premenopausal
  - Follicles/ corpus luteum cysts

- Early Menopause (within 2 years after last menstrual period)
  - Cysts represent residual function
  - Autopsy study: “small (<50 mm) benign adnexal cysts… are so common in postmenopausal women that their presence may be regarded as normal.”

Smith-Bindman R, Poder L, Johnson E, Miglioretti DL. Risk of Malignant Ovarian Cancer Based on Ultrasonography Findings in a Large Unselected Population. JAMA Intern Med 2019;179(1):71–77.
Suh-Burgmann E, Flanagan T, Osinski T, Alavi M, Herrinton L. Prospective Validation of a Standardized Ultrasonography-Based Ovarian Cancer Risk Assessment System. Obstet Gynecol 2018;132(5):1101–1111.

Current Recommendations

- Strong and consistent evidence that simple adnexal cysts have negligible (if any) association with ovarian cancer

- Woman with an asymptomatic, simple adnexal cyst has no difference in cancer risk compared with a woman without a cyst irrespective of menopausal status or cyst size.

- Education of patients and clinicians important because up to 20% of women think cysts have an association with cancer

Current SRU Guidelines

Post Menopausal:

- ≤1 cm:
  - do not describe, or call follicles
  - No follow up
- >1-3cm
  - describe
  - No follow up
- >3-5cm
  - Describe and follow up

Pre-Menopausal:

- ≤1-3cm:
  - do not describe or call follicles
  - No follow up
- >3-5cm
  - describe
  - No follow up
- >5cm-7cm
  - Describe and follow up

Issues with US Follow-Up

- Increase possibility of surgical intervention and unintended harm
  - Morbidity and mortality : 3.1%-15 %
    - Fever, UTI, urinary retention, bladder injury, wound complications, pulmonary or cardiovascular complications
- Increase patient and clinician anxiety

Froyman W, Landolfo C, De Cock B, et al. Risk of complications in patients with conservatively managed ovarian tumours (IOTA5): a 2-year interim analysis of a multicentre, prospective, cohort study. Lancet Oncol2019;20(3):448–458.

Baldwin LA, Pavlik EJ, Ueland E, et al. Complications from Surgeries Related to Ovarian Cancer Screening. Diagnostics (Basel) 2017;7(1):E16

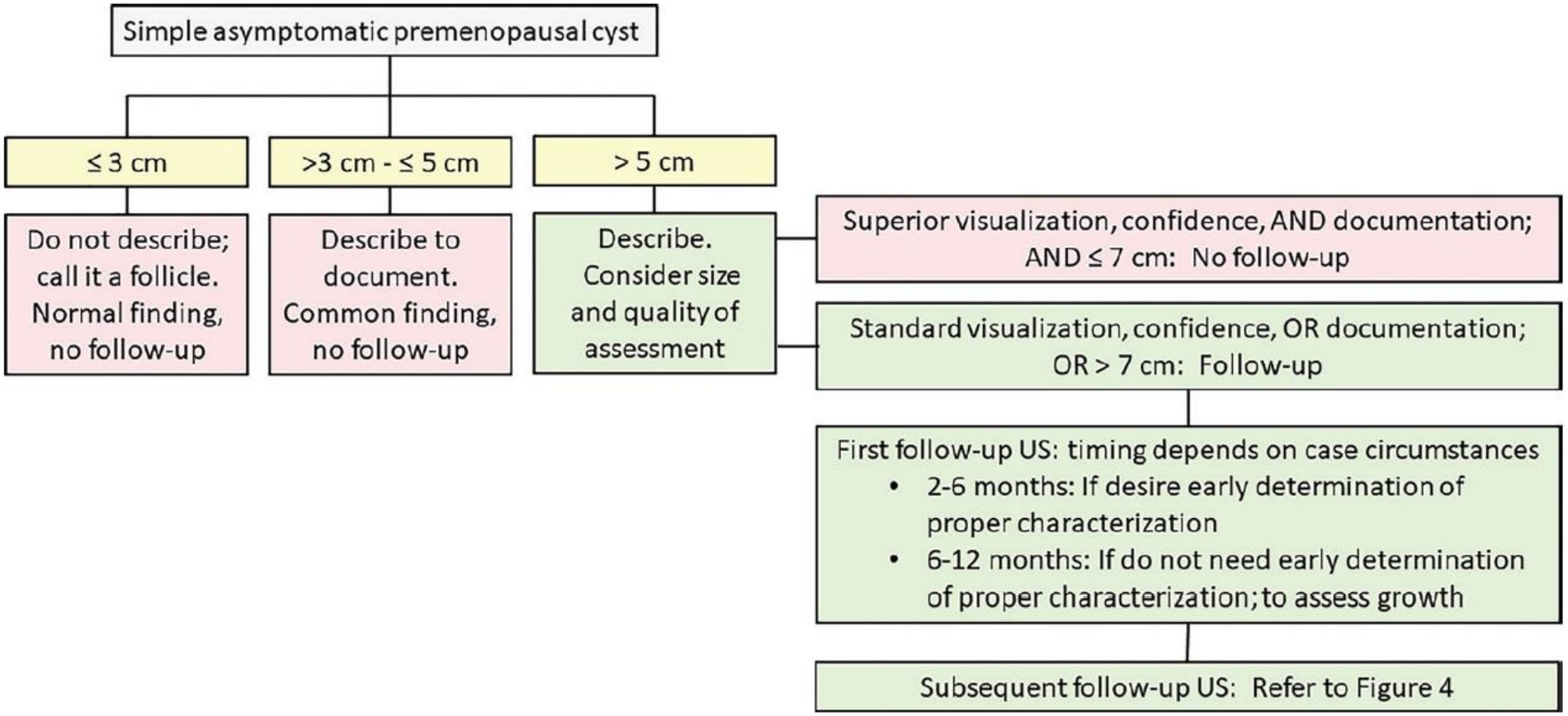
Why Describe Small Cysts?

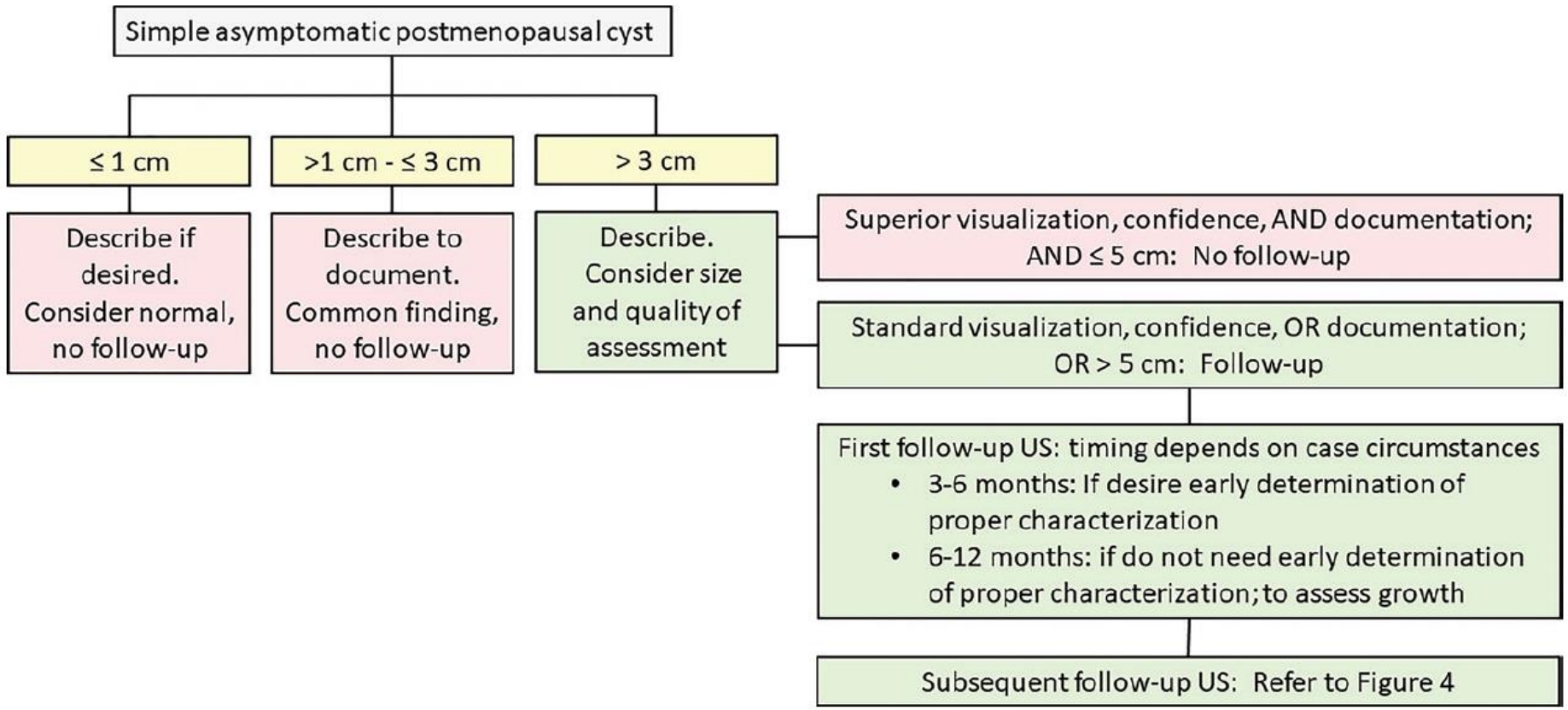
- Need to document larger cysts so when imaged elsewhere, context for comparison
- Need to balance with patient and clinician anxiety
  - State in report that ovary is normal

Surveillance: Risk of Cyst Mischaracterization

- Cannot confidently characterize as simple
  - US quality
  - Patient body habitus
  - Cyst location
  - Cyst size : in larger cysts easy to miss small nodular component

2021 SRU Guidleines




Simple asymptomatic postmenopausal cyst
≤ 1 cm
>1 cm - ≤ 3 cm
> 3 cm
Describe if desired. Consider normal, no follow-up
Describe to document. Common finding, no follow-up
Describe. Consider size and quality of assessment
Superior visualization, confidence, AND documentation; AND ≤ 5 cm: No follow-up
Standard visualization, confidence, OR documentation; OR > 5 cm: Follow-up
First follow-up US: timing depends on case circumstances
• 3-6 months: If desire early determination of proper characterization
• 6-12 months: if do not need early determination of proper characterization; to assess growth
Subsequent follow-up US: Refer to Figure 4

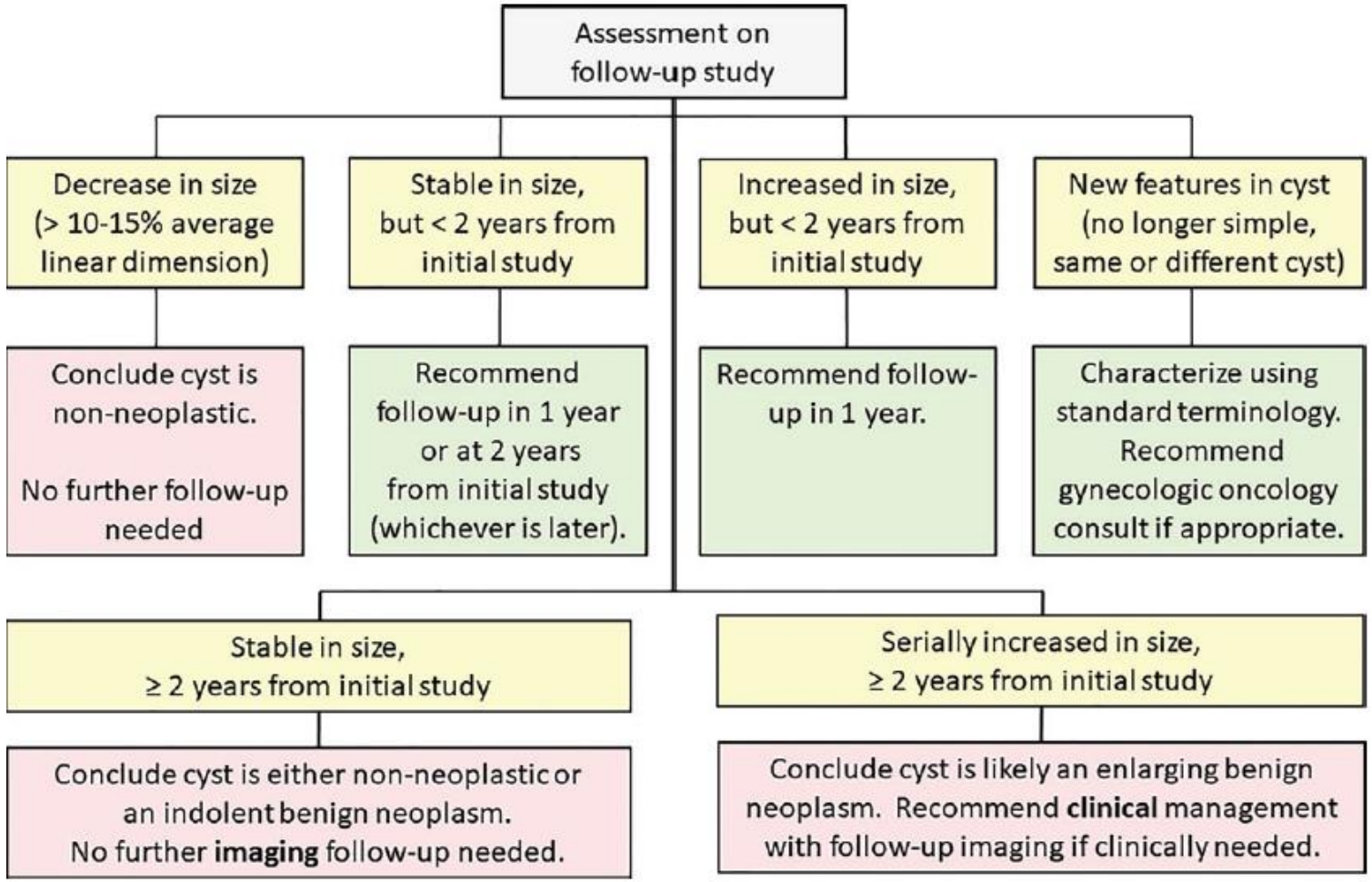


Figure 4: Flowchart shows recommendations for imaging after follow-up of simple asymptomatic cyst in either pre- or postmenopausal

Take home points

Most if not all simple adnexal cysts are benign and do not have malignant potential

Guidelines different for premenopausal and post menopausal women

Educate patients, even postmenopausal women that simple cysts do not have malignant potential

Most Asked Questions

- Cyst follow up
  - Ovarian Cysts
  - Pancreatic Cysts
  - Renal cysts

Pancreatic Cysts/Incidentaloma

- Discovery of small pancreatic cysts is a daily occurrence in radiology due to technical advances in multidetector computed tomography (MDCT), magnetic resonance imaging (MRI), and ultrasonography
  - 1.2–2.6% of abdominal MDCT
  - 13.5–19.9% of abdominal MRI
- Pancreatic incidentalomas are unexpected, asymptomatic abnormalities that are discovered serendipitously while screening for other diseases or actively searching for other pathology

Pancreatic Cysts

Dilemma for both clinicians and radiologists:

- Should these small cystic structures be ignored or followed up?
- How and when should they be followed up?
- When should they be aspirated or removed?
- Will become increasingly common as the population ages and imaging technology improves

Pancreatic Cysts

- In the past, thought to be pseudocysts.
  - represent the majority of cystic pancreatic lesions in patients with a history of acute or chronic pancreatitis or risk factors for these diseases,
  - a minority of incidentally found lesions in the general population
- Improvements in cross-sectional imaging techniques over the past 15 years,
  - serous cystadenoma (SC),
  - mucinous cystic neoplasm (MCN)
  - intraductal papillary mucinous neoplasm (IPMN)
- now account for most of the pancreatic cysts found in asymptomatic individuals.

Intraductal Papillary Mucinous Neoplasm: IPMN

- most common cystic pancreatic neoplasm
  - 70% of all pancreatic cystic neoplasms
- a large and heterogeneous group of epithelial mucin-producing tumors communicating or involving the main pancreatic duct
- may be multifocal
- have a malignant potential following an adenoma–carcinoma sequence.
- It is characterized by a unique feature such as increased de novo development of pancreatic ductal adenocarcinoma elsewhere in the pancreas, suggesting the presence of diffuse pathologic changes predisposing to malignant transformation

Pancreatic Cysts

- As a rule, cystic pancreatic lesions are most often benign or low-grade indolent neoplasms
- If cyst is mucinous, it does have a real, albeit small, malignant potential
- Many pancreatic cysts remain undetermined, and default assumption is that they are mucinous
- Guidelines are needed for follow up and management

Pancreatic Cysts

- The CAR Incidental Findings Working Group was formed in February 2018
- American College of Radiology Guidelines formed the basis of the CAR incidental findings working group recommendations
- Blend the 2017 International Consensus Guidelines, the 2017 ACR white paper on incidental pancreatic cystic lesions, and the 2015 American Gastroenterology Recommendations
- 2021 Canadian guidelines for the management of

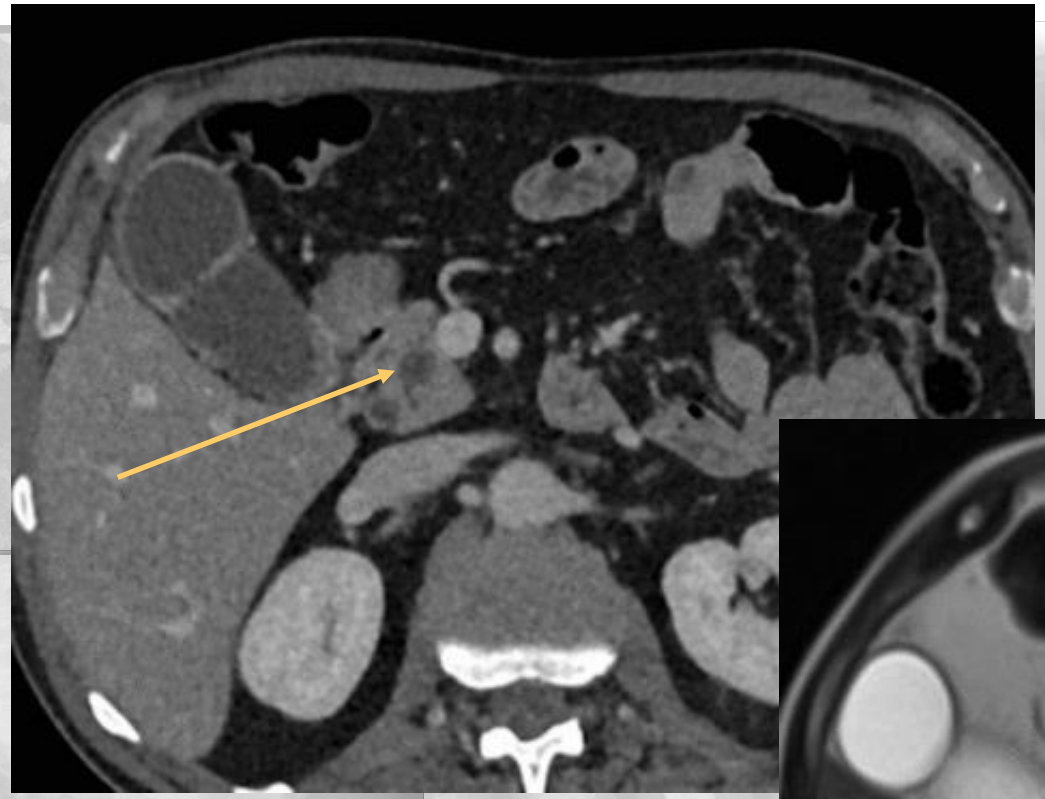
Pancreatic Cysts

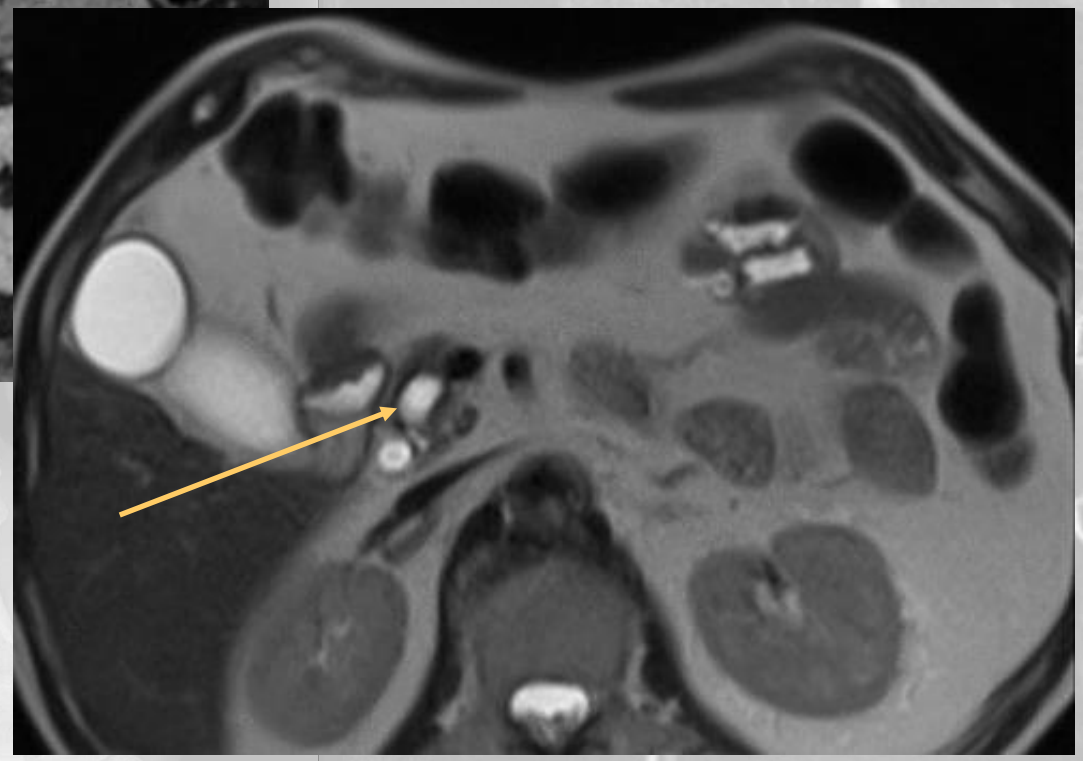
- The recommendations only apply to patients between the ages of 40 and 75
- Patients less than age 40 with a simple pancreatic cystic lesion should also be referred to gastroenterology for a complete risk assessment and possible EUS
- For patients with multiple simple cystic pancreatic lesions, the most concerning lesion by size or morphology should be used to determine subsequent management

Pancreatic Cysts: 2021 CAR

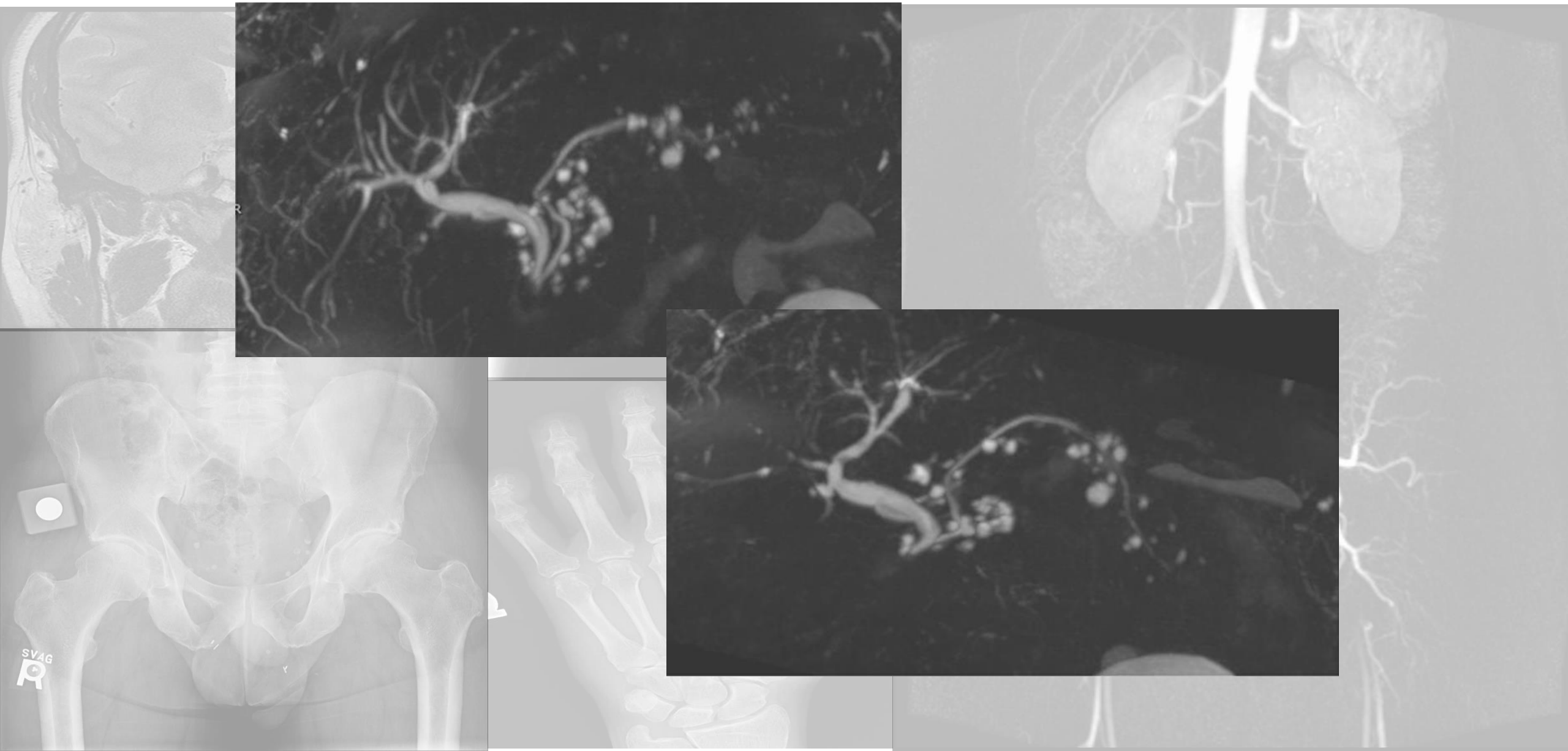
- Simple pancreatic cystic lesions 5mm or less do not require follow up imaging
- Upper age limit for follow up imaging is 75 years
- Both suggest follow up imaging limited to a total of 10 years

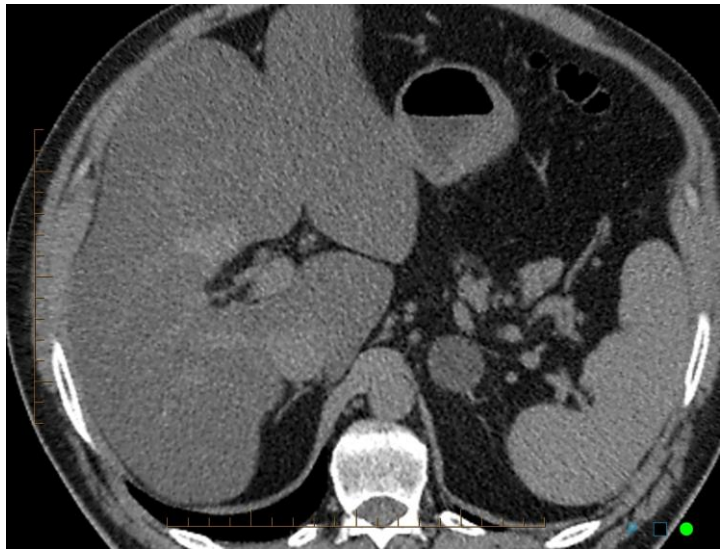
Pancreatic Cysts

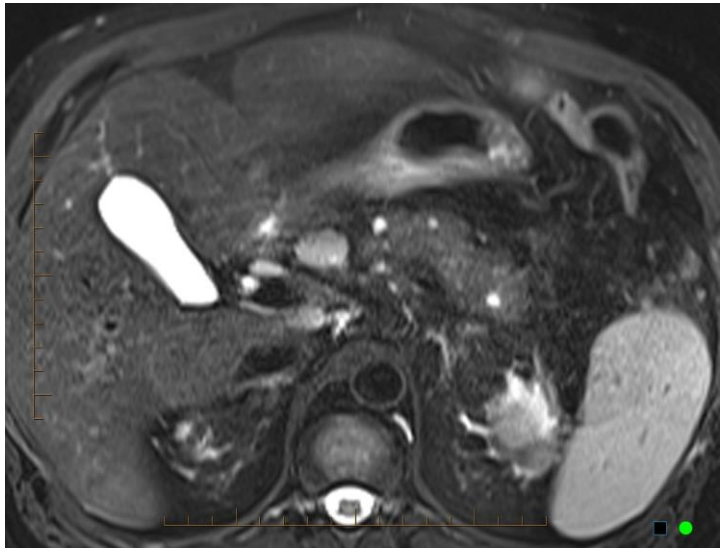


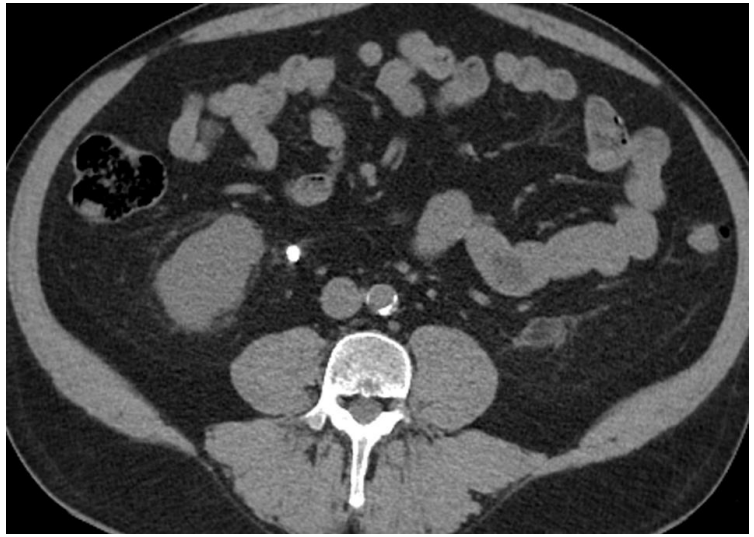


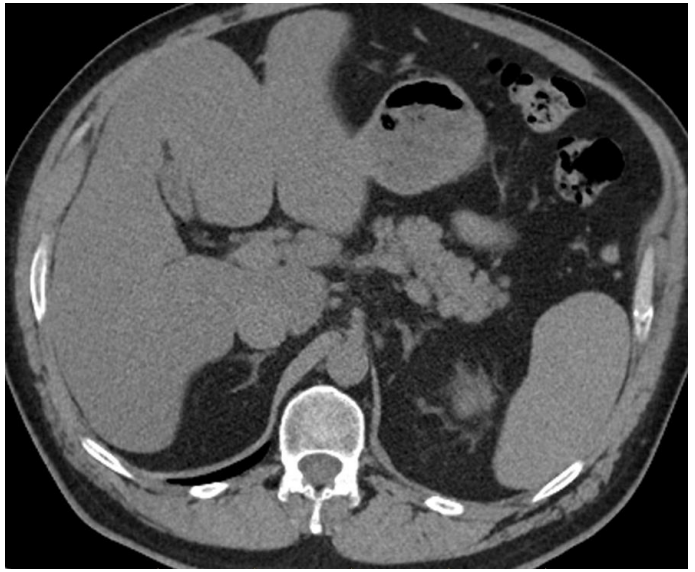
MRCP



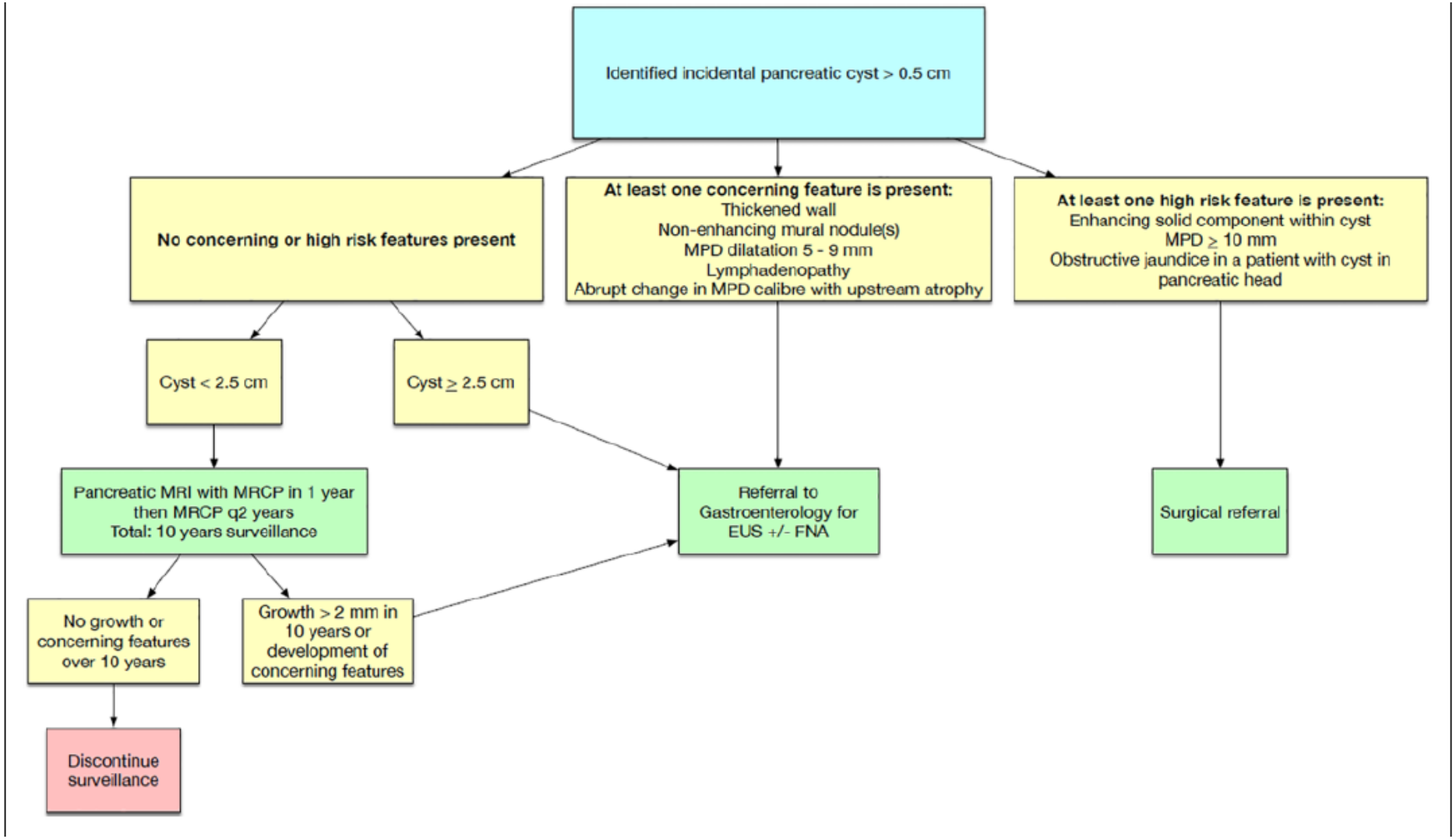




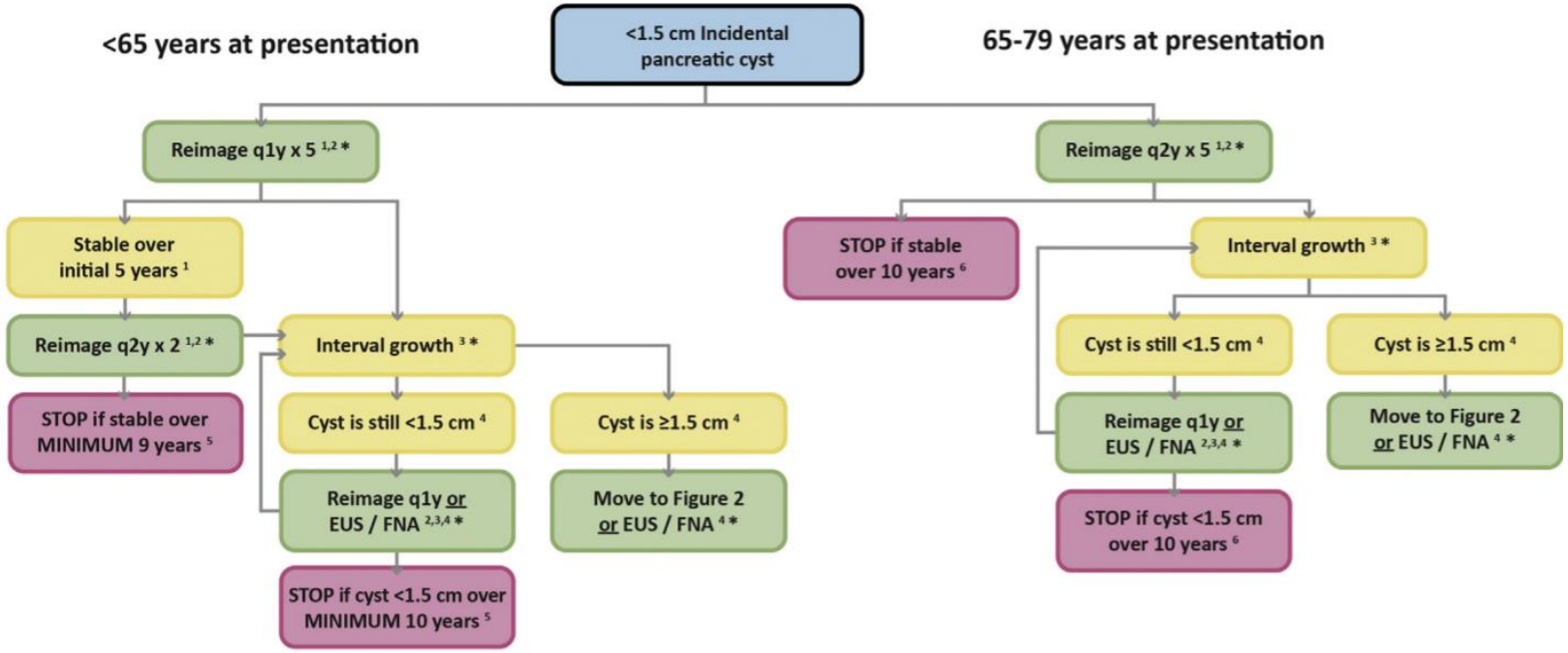




CAR 2021 Consensus



ACR 2017 White Paper



LEGEND

1 While single follow-up of tiny "white dot" lesions at 2 years is appropriate, the need for further follow-up and length of follow-up, if stable, is unknown. Some radiologists do not report these lesions for patients with advanced age (>75-80 years of age).

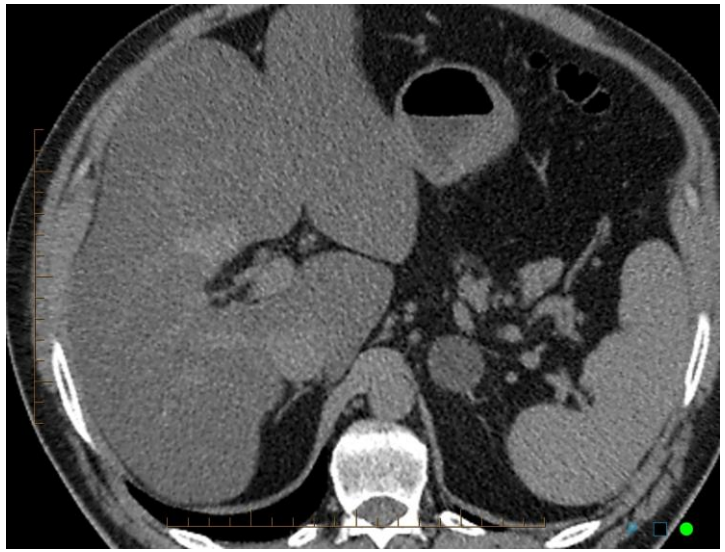
2 Imaging follow-up with contrast-enhanced MRI or pancreas protocol CT.

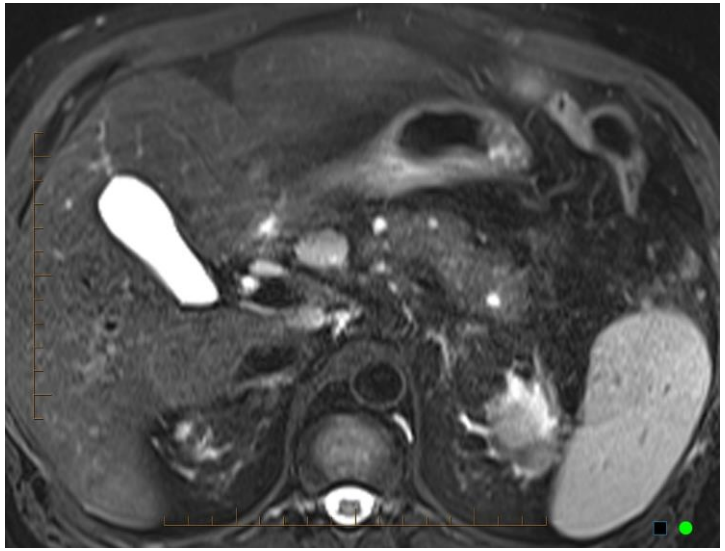
3 Growth defined as 100% increase in longest axis diameter (on axial or coronal image) for cysts <5mm, and 50% increase for cysts ≥5mm and <15mm. No growth = stable.

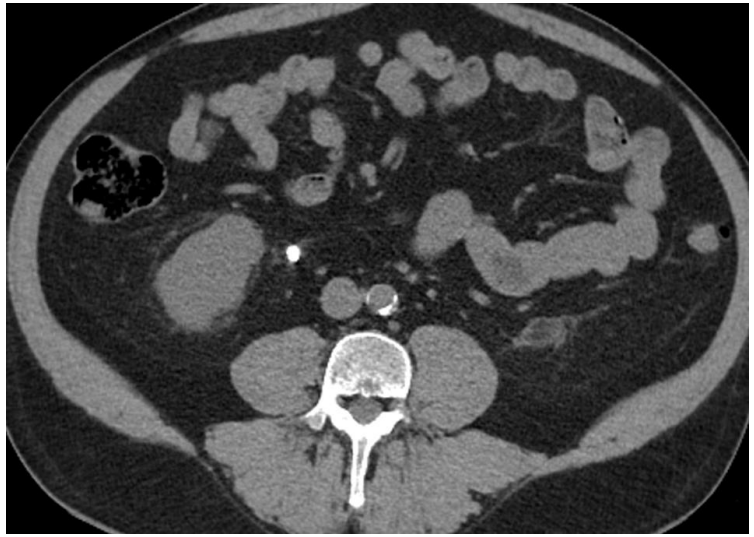
4 Following growth, imaging follow-up or EUS/FNA may be performed. In general, EUS/FNA merits stronger consideration for larger or faster-growing cysts relative to smaller or slower-growing cysts. After EUS/FNA, further work-up is result-dependent (see Figure 2B).

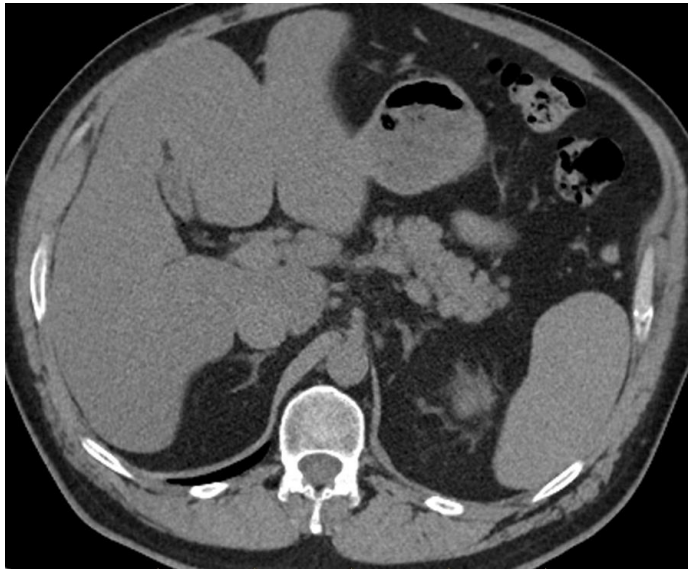
5 Some may choose to continuously follow cysts detected in patients <65-years-old until those patients reach 80.

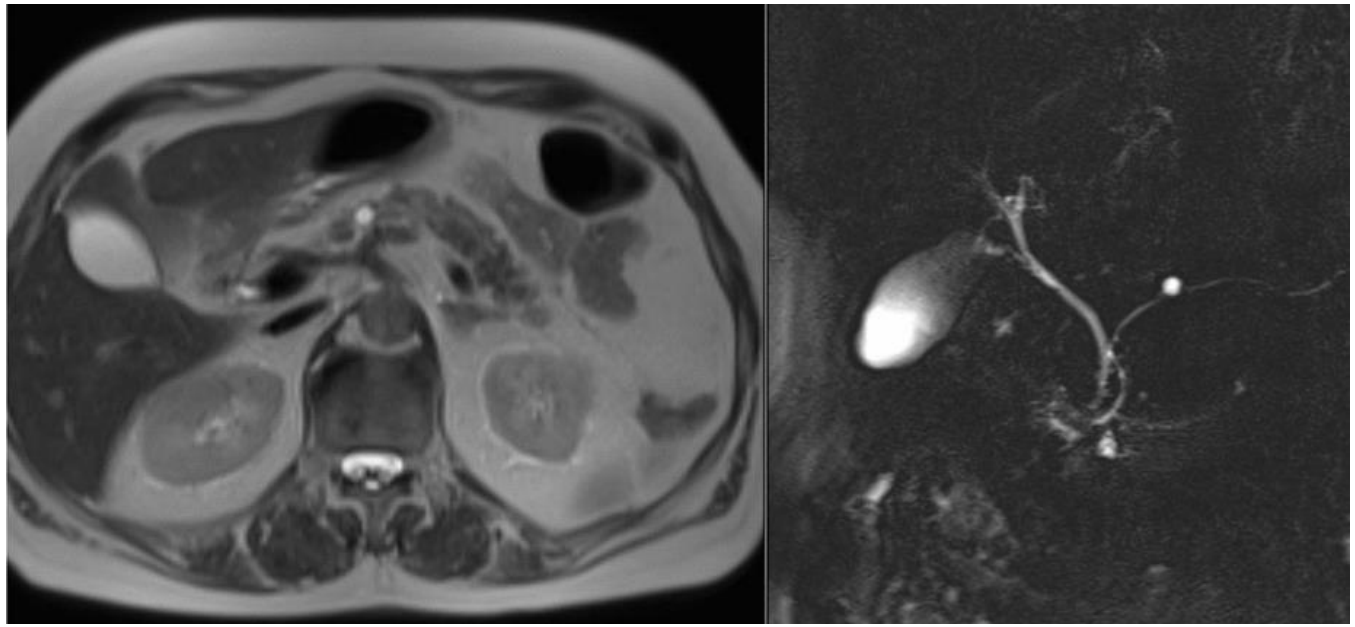
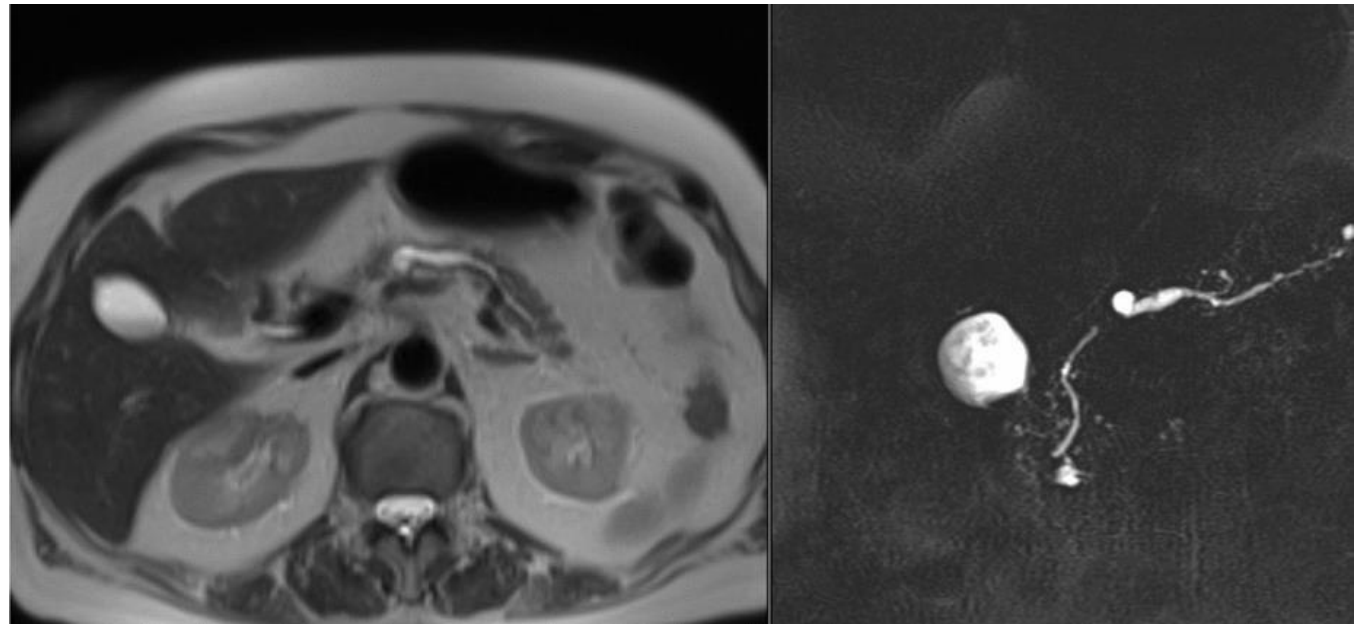
6 If the patient reaches 80 years before the end of follow-up, follow-up should generally stop. If the patient is close to – but not yet – 80 years when the cyst is first detected, then when the patient reaches 80 years, Figure 4 can be used to guide further management.









Pancreatic Cysts

- Management of incidental cystic lesions of the pancreas remains divisive and challenging in a health care system facing increasing issues balancing the cost of medical imaging with the probability of significant disease

Take Home Points

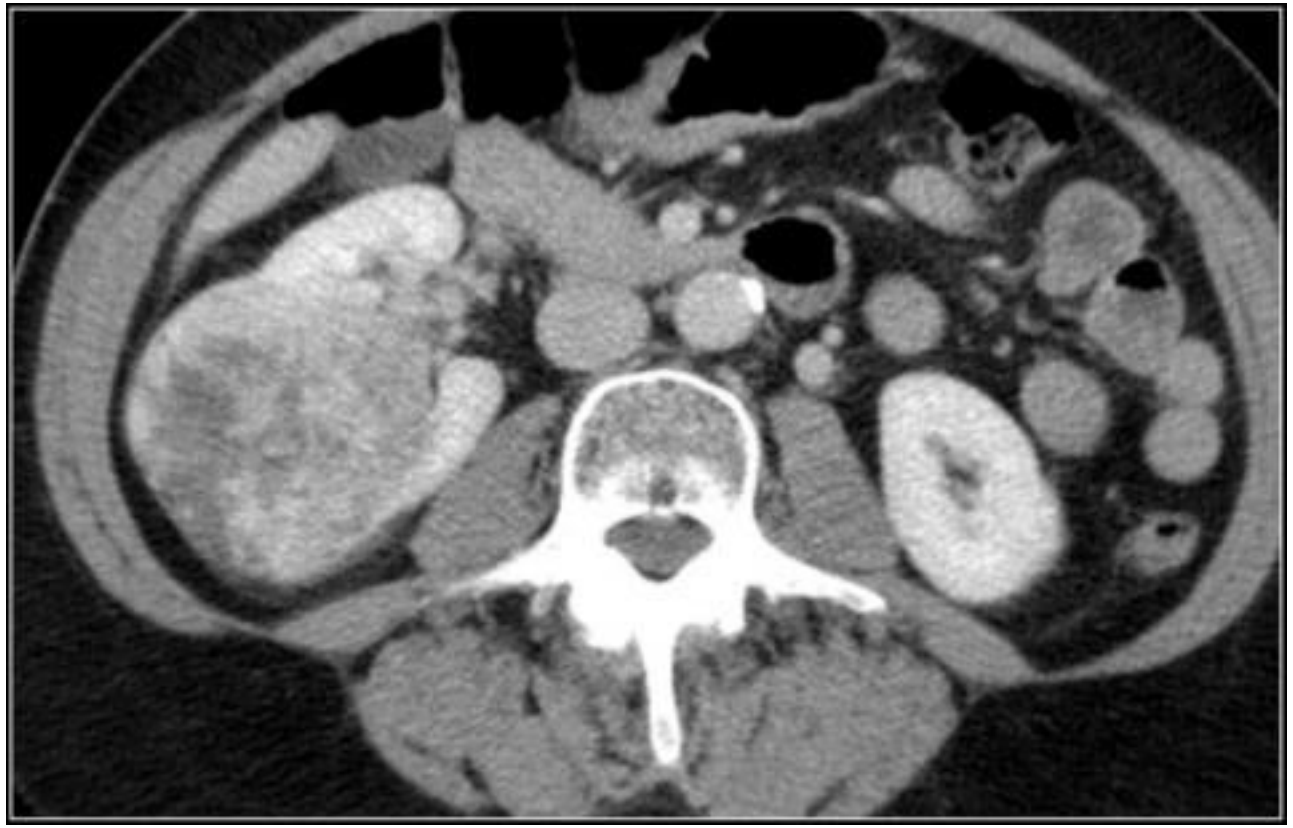
- Natural history of small cysts remains observational
- Default assumption is incidental cyst is mucinous
- Extended follow-up

Most Asked Questions

- Cyst follow up
  - Ovarian Cysts
  - Pancreatic Cysts
  - Renal cysts

Incidental Renal Masses

An incidental renal mass is one initially found on an imaging study performed for an indication other than that related to the urinary tract



Renal cysts: US

- Simple Cyst
  - Anechoic
  - Thin border walls
- If cannot classify as simple, lesion is classified as complex
  - Body habitus
  - Breathing artefacts
  - Cyst size

The Problem?

- Renal cysts are common – prevalence - 40%
- Renal cell carcinoma
  - Estimated less than 4% of new cancers
  - BUT 2/3rds are found as incidental findings
- Dilemma
  - Differentiate between a “leave alone” lesion from a lesion that requires treatment

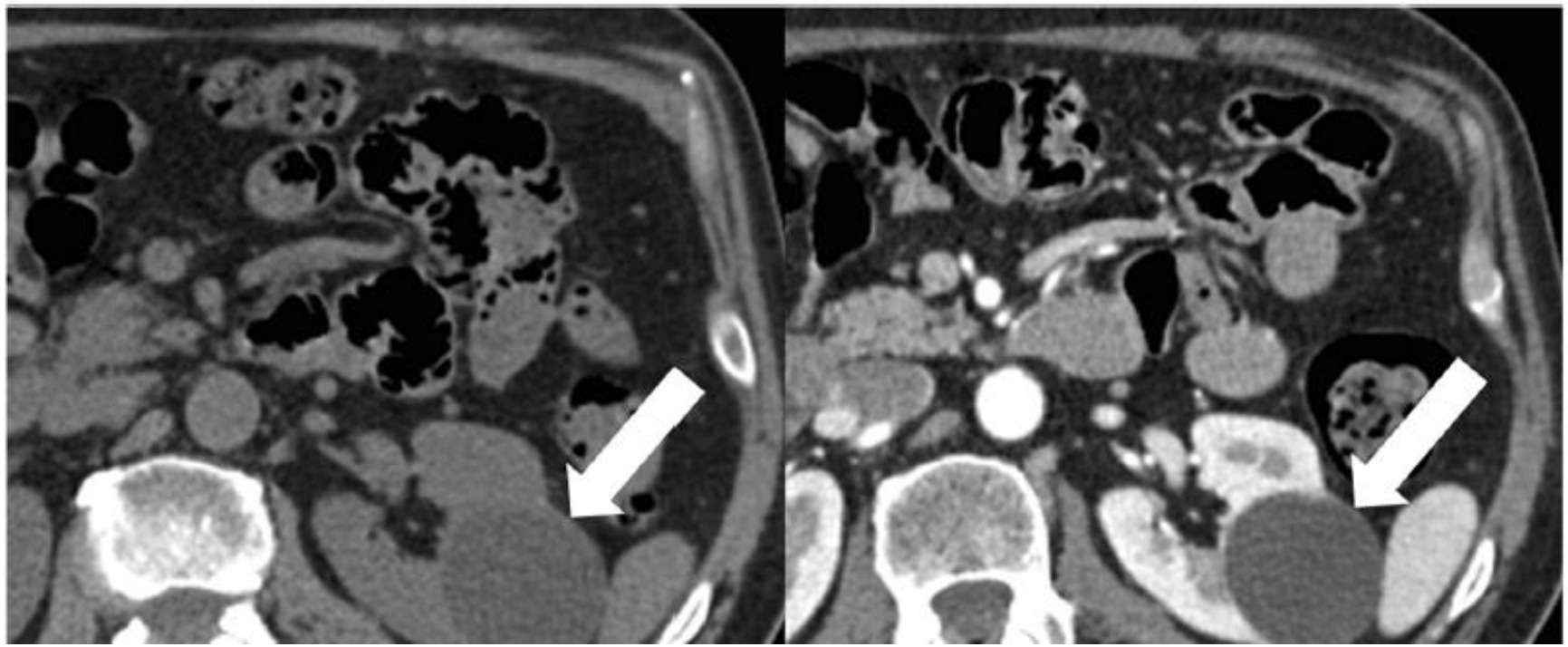
Cyst Characteristics

1) Size (largest dimension)
2) Homogeneous or heterogeneous
3) Attenuation
4) Enhancement
5) Cyst complexity (Bosniak classification)
6) Growth and morphologic changes

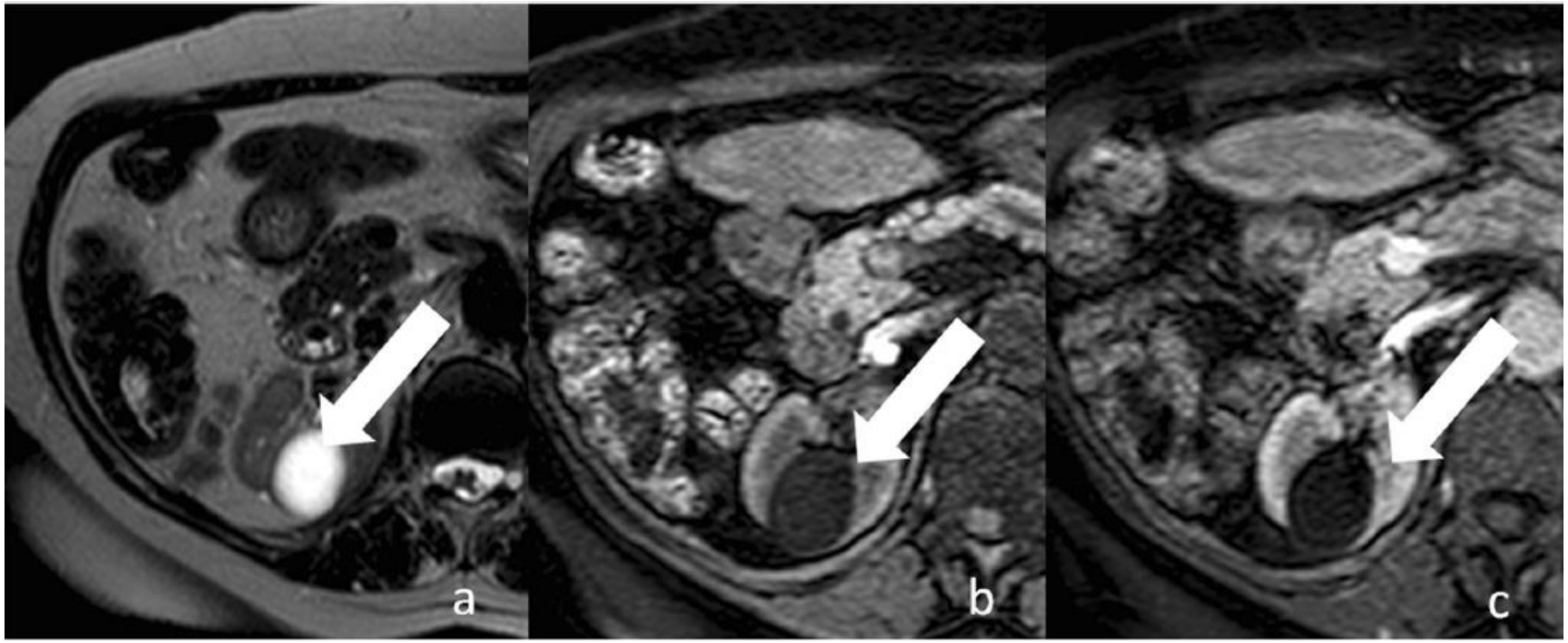
Bosniak Classificaction

Lesion Type	Morphology	Calcification	Septations	Cyst Wall	Management
Bosniak I	Simple cyst with fluid attenuation (0–20 HU)	None	None	Thin and smooth	Benign; no follow-up needed
Bosniak II	Minimally complex cyst or a well-marginated, uniformly hyperattenuating cyst; diameter ≤3 cm; partially outside the kidney	Fine or minimally thick calcifications in wall or septa*	A few hairline-thin septa without measurable enhancement*	Thin and smooth	Benign; no follow-up needed
Bosniak IIF	More complex elements than a Bosniak II cyst but fewer than a Bosniak III cyst, or a uniformly hyperattenuating cyst that does not meet Bosniak II criteria	May contain a few small nodular calcifications*	Multiple thin internal septations without measurable enhancement*	May be mildly thickened, without measurable enhancement	Follow-up CT or MR imaging to assess for increasing complexity, which may indicate malignancy
Bosniak III	Complex cyst with enhancing septations or wall	Variable	May be thick or irregular, with measurable enhancement	May be thick or irregular, with measurable enhancement	30%–100% chance of malignancy; resection recommended
Bosniak IV	Cystic mass with enhancing soft-tissue components	Variable	Clearly enhancing nodule in septa	Clearly enhancing nodule in wall	Malignant until proven otherwise; resection recommended

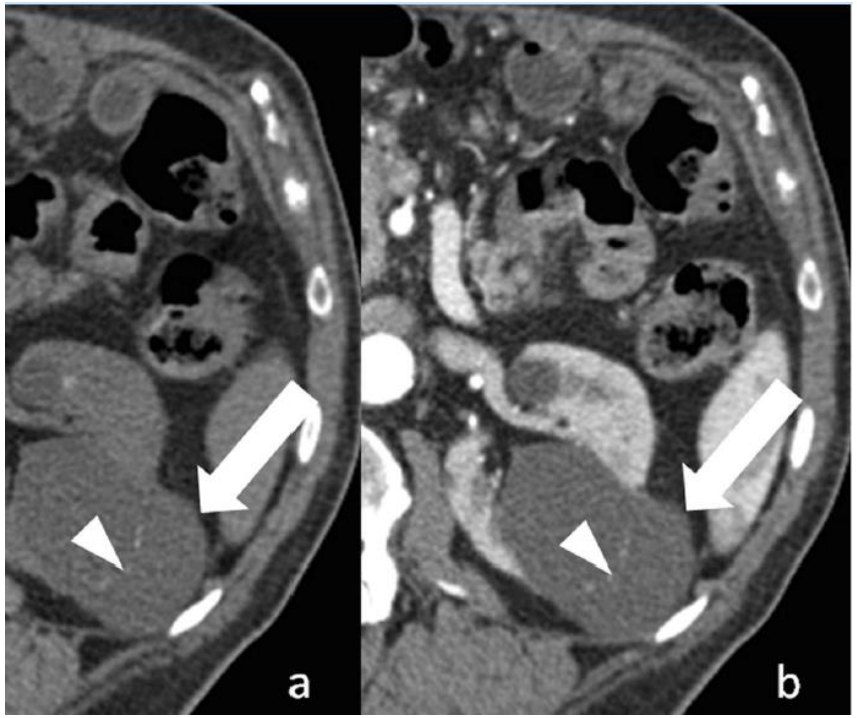
Bosniak 1

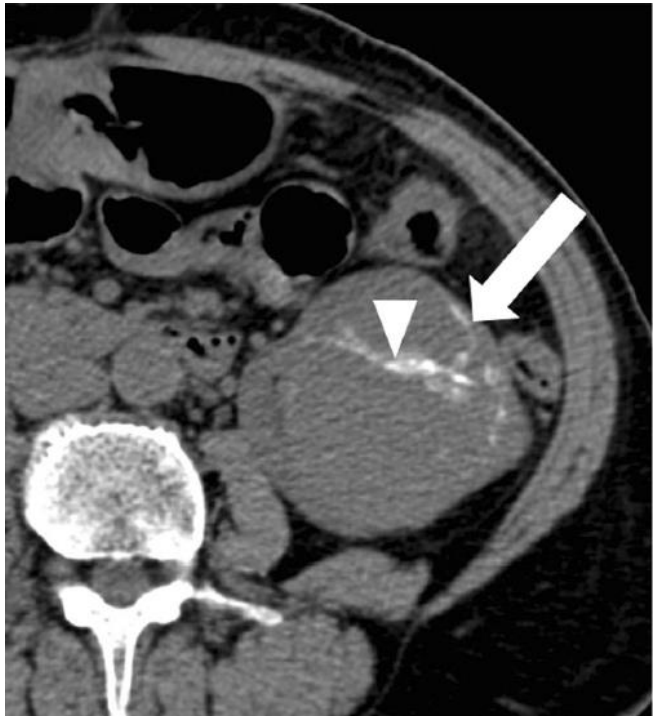


MR: Bosniak 1 Cyst



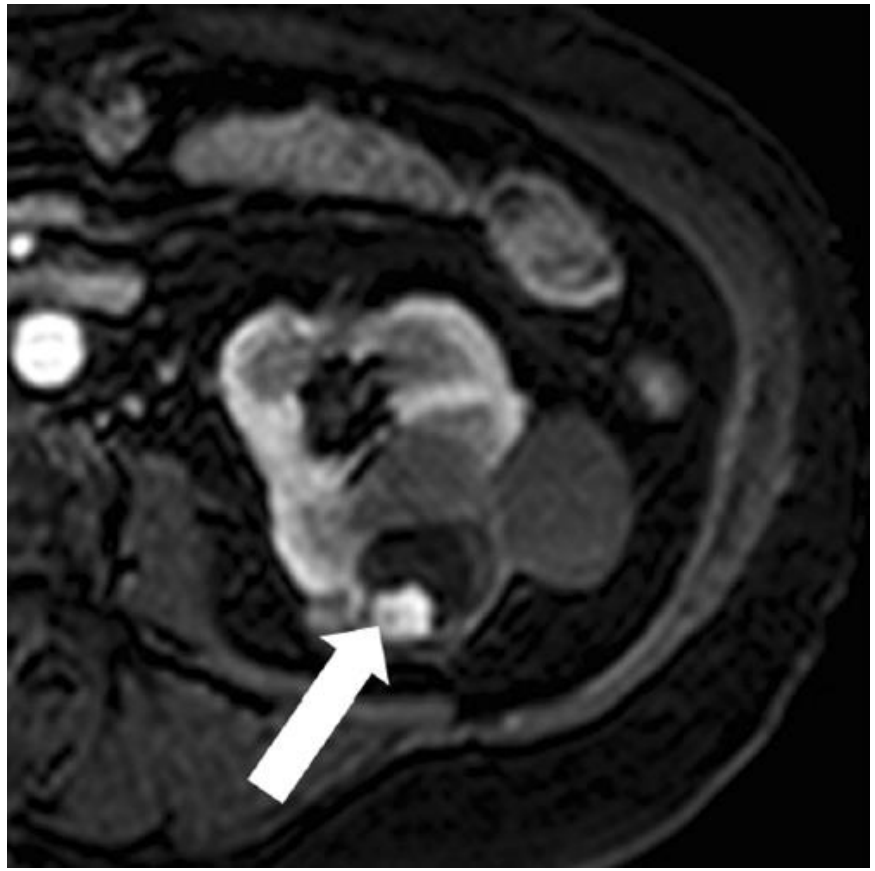
CT: Bosniak 2 and 2F





CT: Bosniak 2F Hemorrhagic Cyst

MR: Bosniak 3 and 4



ACR 2017 Guidelines

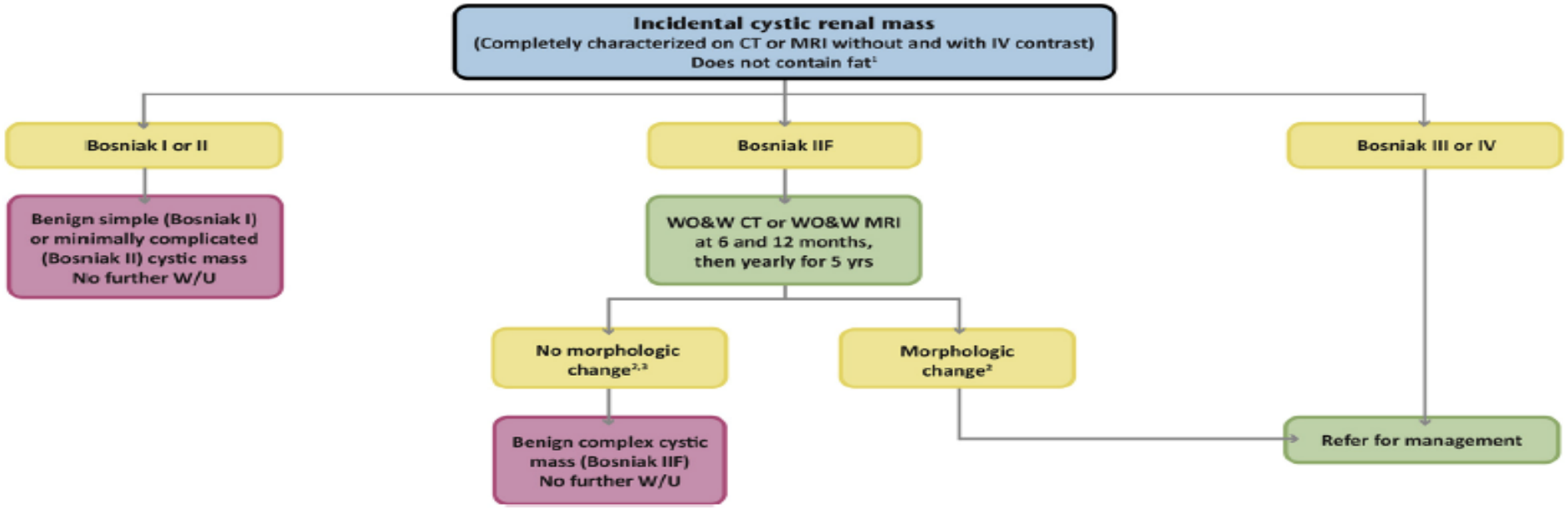


Fig 3. Flowchart for managing a cystic renal mass on CT or MRI performed both without and with IV contrast. [1]If the mass contains fat attenuation (a region of interest < −10 HU), refer to Figure 5. [2]Morphologic change includes increasing number of septa, thickening of the wall or septa, or development of a solid nodular component (including reclassification as Bosniak III or IV). Growth of a cystic mass without morphologic change is not indicative of malignancy. [3]A Bosniak IIF cystic renal mass without change in imaging features for at least 5 years is considered stable and likely of no clinical significance. HU = Hounsfield unit; IV = intravenous; WO&W = without and with; W/U = work-up.

Take Home Points

- Cystic renal lesions are commonly encountered on radiologic examinations
- Complex and multifocal cystic renal lesions are often a diagnostic challenge since they can represent neoplastic and non-neoplastic conditions
- The Bosniak classification system is a well-established imaging method in the differentiation of nonsurgical from surgical lesions