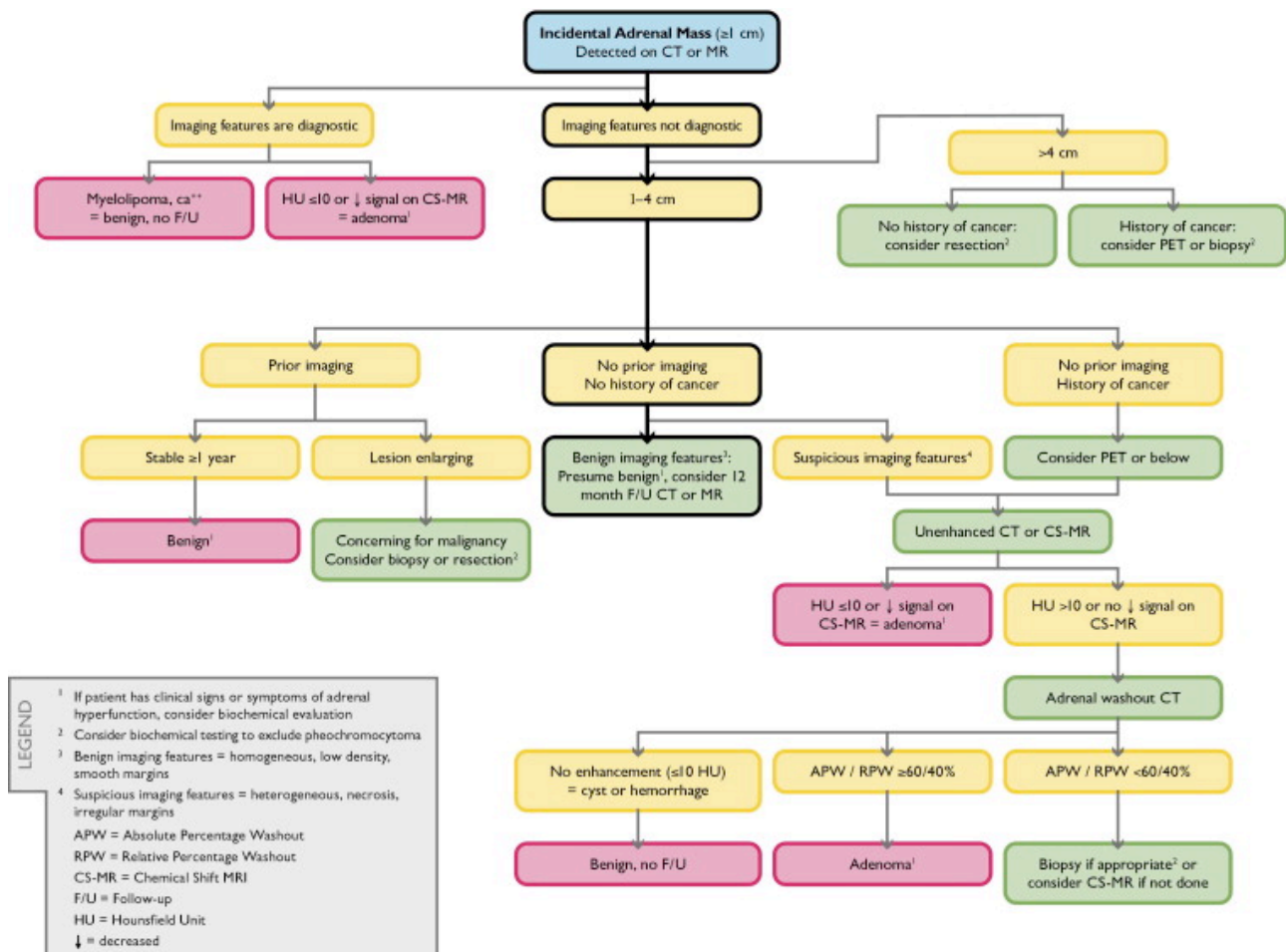


MANAGEMENT RECOMMENDATIONS

1. Adrenal masses	page 2
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4. Ovarian and Adnexal Cysts	pages 7-10
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ADRENAL MASS



1. Size Criteria < 4cm and > 4cm

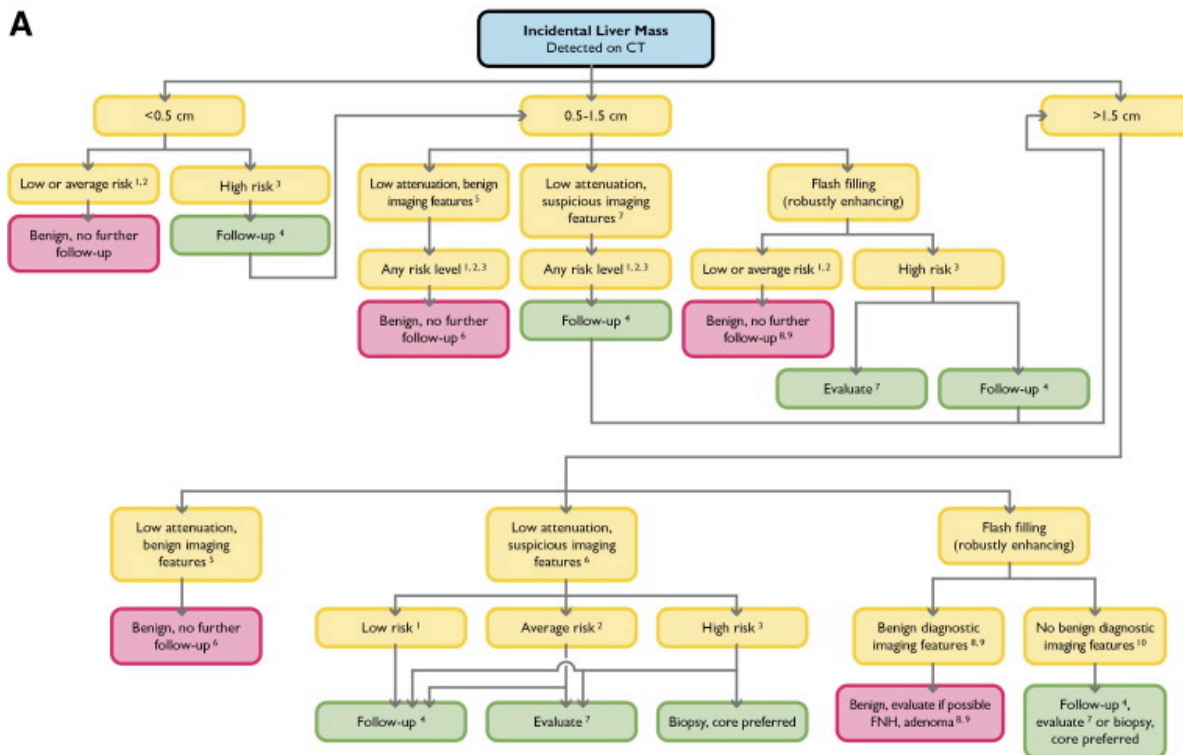
2. Lesion Stability 12 months - benign

3. Look for intracellular lipid - NECT, Contrast washout CT, Chemical Shift MR Spectroscopy

Managing Incidental Findings on Abdominal CT: White Paper of the ACR Incidental Findings Committee J Am Coll Radiol 2010;7:754-773.

LIVER MASS

A



B

Incidental Liver Mass
Detected on CT

LEGEND	1 Low risk individuals: Young patient (≤ 40 years old), with no known malignancy, hepatic dysfunction, hepatic malignant risk factors, or symptoms attributable to the liver.	7 Suspicious imaging features: Ill-defined margins, enhancement (more than about 20 HU), heterogeneous, enlargement. To evaluate, prefer multiphasic MRI.
	2 Average risk individuals: Patient >40 years old, with no known malignancy, hepatic dysfunction, abnormal liver function tests or hepatic malignant risk factors or symptoms attributable to the liver.	8 Hemangioma features: Nodular discontinuous peripheral enhancement with progressive enlargement of enhancing foci on subsequent phases. Nodule isodense with vessels, not parenchyma.
	3 High risk individuals: Known primary malignancy with a propensity to metastasize to the liver, cirrhosis, and/or other hepatic risk factors. Hepatic risk factors include hepatitis, chronic active hepatitis, sclerosing cholangitis, primary biliary cirrhosis, hemochromatosis, hemosiderosis, oral contraceptive use, anabolic steroid use.	9 Small robustly enhancing lesion in average risk, young patient: hemangioma, focal nodular hyperplasia (FNH), transient hepatic attenuation difference (THAD) flow artifact, and in average risk, older patient: hemangioma, THAD flow artifact. Other possible diagnoses: adenoma, arterio-venous malformation (AVM), nodular regenerative hyperplasia.
	4 Follow-up CT or MRI in 6 months. May need more frequent follow-up in some situations, such as a cirrhotic patient who is a liver transplant candidate.	10 Hepatocellular or common metastatic enhancing malignancy: islet cell, neuroendocrine, carcinoid, renal cell carcinoma, melanoma, choriocarcinoma, sarcoma, breast, some pancreatic lesions.
	5 Benign imaging features: Typical hemangioma (see below), sharply margined, homogeneous low attenuation (up to about 20 HU), no enhancement. May have sharp, but irregular margins.	
	6 Benign low attenuation masses: Cyst, hemangioma, hamartoma, Von Meyenberg complex (bile duct hamartomas).	

1. Size Criteria <0.5 , $0.5-1.5$ and >1.5 cm

2. CE Pattern - benign, flash-filling and suspicious (ring enhancement)

3. Stratify according to clinical risk (see legend)

4. Note reluctance of Australian Hep-Bil Surgeons to biopsy potentially resectable lesions.

Managing Incidental Findings on Abdominal CT: White Paper of the ACR Incidental Findings Committee *J Am Coll Radiol* 2010;7:754-773.

Absent nasal bone

See technical note.

An absent nasal bone (NB) in the second trimester has been estimated to have a likelihood ratio of 83 times (Bromley et al. 2002) the background risk of aneuploidy and as such, all reasonable efforts should be made to identify this marker. If this is found:

- > Counselling / amniocentesis should be offered.

Nuchal fold

See technical note.

A thickened nuchal fold (NF) i.e. ≥ 6 mm from 15-20 completed weeks gestation has been associated with an increased risk of trisomy 21 with a likelihood ratio of 17 (95 % CI 8-38) (Smith-Bindman et al. 2001). If this is found:

- > Calculate a new risk for Down syndrome: $17 \times$ prior risk
- > If the new risk level is increased (≥ 1 in 250) counselling / amniocentesis should be offered.

Echogenic bowel

See technical note.

First trimester bleeding appears to be a common cause (presumably due to swallowed blood) but a history of first trimester bleeding does not exclude other causes which include aneuploidy, fetal infections, an association with cystic fibrosis and fetal growth restriction.

- > Calculate new risk for Down syndrome: $6 \times$ earlier risk (95 % CI 3-13) (Smith-Bindman et al. 2001).
- > If new risk level is increased (≥ 1 in 250) offer amniocentesis. If doing amniocentesis save fluid for microbiological analysis (Polymerase chain reaction and culture) pending maternal serology.
- > Infection risk: Carry out maternal blood serology for common prenatal infections (CMV specifically). Toxoplasmosis, varicella, and parvovirus less so and more commonly present with discrete echogenic foci (commonly liver) rather than hyperechoic bowel. Serology can be considered for these if the type of echogenicity of the fetal abdomen is equivocal.
- > Cystic fibrosis risk: Offer counselling and parental testing for cystic fibrosis carrier status (detects approximately 80 % of carriers). If both parents are carriers, offer amniocentesis for fetal DNA analysis
- > Intrauterine growth restriction risk: perform growth scan at approximately 28-32 weeks

Shortened humerus

Shortened humerus ($< 2.5^{\text{th}}$ percentile from standard charts) have both been associated with an increased risk of chromosomal abnormalities. The humerus has been shown to be a more reliable discriminator for trisomy 21 than the femur. For this reason, humerus length should be considered as part of the routine assessment at time of morphology exam

Shortened long bones can also indicate skeletal dysplasia or early onset intrauterine growth restriction (IUGR)

- > Calculate new risk for Down syndrome based on the bone which is short:
 - > Short humerus – new risk for Down syndrome: 7.5 x earlier risk (95 % CI 5-12)
- > If new risk level is increased (≥ 1 in 250) counselling / amniocentesis should be offered.
- > Consider possibility of early IUGR or skeletal dysplasia. The latter is more likely if there is: severe long bone shortening, abnormal morphology of long bones, ribs or vertebrae and / or abnormality of skull shape

Shortened femur

Shortened femur ($< 2.5^{\text{th}}$ percentile from standard charts) has been associated with an increased risk of chromosomal abnormalities. Shortened long bones can also indicate skeletal dysplasia or early onset intrauterine growth restriction (IUGR).

- > Calculate new risk for Down syndrome based on the bone which is short:
 - > Short femur – new risk for Down syndrome: 2.7 x earlier risk (95 % CI 5-12)
- > If new risk level is increased (≥ 1 in 250) counselling / amniocentesis should be offered.
- > Consider possibility of early IUGR or skeletal dysplasia. The latter is more likely if there is: severe long bone shortening, abnormal morphology of long bones, ribs or vertebrae and/or abnormality of skull shape.

Pyelactasis

See technical note.

Isolated mild pelviectasis is a very uncommon finding in aneuploidy.

Pyelactasis has been associated with an increased risk of hydronephrosis and postnatal urinary reflux.

- > There is no need to discuss aneuploidy as the likelihood ratio crosses 1
- > Notify the patient of the need for third trimester/early neonatal review to assess for progression to hydronephrosis.

Single umbilical artery

Isolated single umbilical artery is a very uncommon finding in aneuploidy. There is, however, an increased risk of fetal growth restriction.

- > There is no need to discuss aneuploidy
- > Arrange a third trimester scan to assess fetal growth

Echogenic intracardiac focus (EIF)

The isolated finding of an EIF in a low-risk patient (i.e. < 1 in 250 risk of a chromosome abnormality at the time of first or second trimester screening or based on maternal age if screening was not performed) is unlikely to be a marker for Trisomy 21. The isolated finding can be ignored as a normal variant providing adequate views have been obtained of all structures.

A possible format for reporting an EIF found at a routine midtrimester ultrasound could be:

"An ultrasound soft marker (EIF) has been noted. The presence of this isolated soft marker has no clinical or functional significance to this fetus and does not need review."

Choroid Plexus Cyst (CPC)

The isolated finding of a CPC in a low risk patient (i.e. < 1 in 250 risk of a chromosome abnormality at the time of first or second trimester screening or based on maternal age if screening was not performed) is unlikely to be a marker for Trisomy 18. The isolated finding can be ignored as a normal variant, providing adequate views have been obtained of all structures and the fingers are seen to be open and not clenched.

A possible format for reporting an CPC found at a routine midtrimester ultrasound could be:

"An ultrasound soft marker (CPC) has been noted. The presence of this isolated soft marker has no clinical or functional significance to this fetus and does not need review."

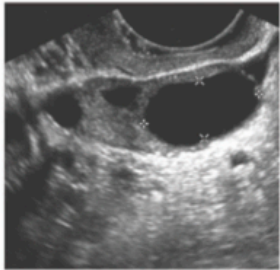
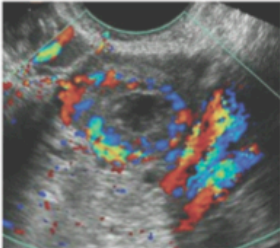


NOTE

If more than one marker is present, these are not additive. Choose the marker with the highest likelihood ratio to recalculate the risk.

See Technical Notes in Reference to confirm technical adequacy of study prior to committing to presence of a soft marker.

South Australian Perinatal Practice Guidelines Chapter 15 Management of ultrasound soft markers of aneuploidy


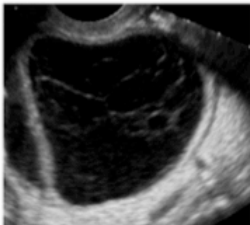
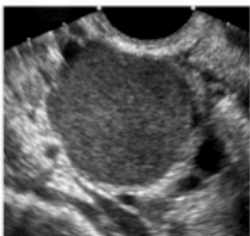



OVARIAN AND ADNEXAL CYSTS - NORMAL APPEARANCES

Normal Appearance		Follow-up*	Comments
Normal ovary appearance: Reproductive age Follicles <ul style="list-style-type: none"> • Thin and smooth walls • Round or oval • Anechoic • Size ≤ 3 cm • No blood flow 		Not needed	Developing follicles and dominant follicle ≤ 3 cm are normal findings
Normal ovary appearance: Reproductive age Corpus luteum <ul style="list-style-type: none"> • Diffusely thick wall • Peripheral blood flow • Size ≤ 3 cm • +/- internal echoes • +/- crenulated appearance 		Not needed	Corpus luteum ≤ 3 cm is a normal finding
Normal ovary appearance: Postmenopausal <ul style="list-style-type: none"> • Small • Homogenous 		Not needed	Normal postmenopausal ovary is atrophic without follicles
Clinically inconsequential: Postmenopausal Simple cyst ≤ 1 cm <ul style="list-style-type: none"> • Thin wall • Anechoic • No flow 		Not needed	Small simple cysts are common; cysts ≤ 1 cm are considered clinically unimportant

Note post-menopausal simple cysts < 1 cm are common and considered clinically important - no follow-up required.

Management of Asymptomatic Ovarian and Other Adnexal Cysts Imaged at US: Society of Radiologists in Ultrasound Consensus Conference Statement Radiology 2010

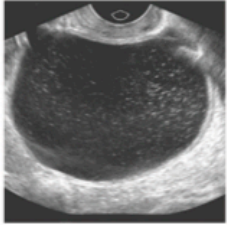
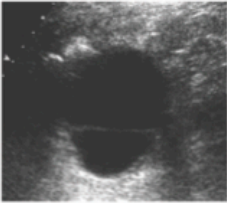

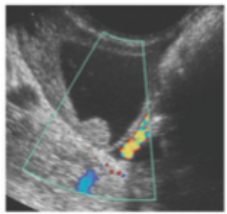
OVARIAN AND ADNEXAL CYSTS - CYSTS WITH BENIGN CHARACTERISTICS

Cysts with benign characteristics		Follow-up*	Comments
Simple cysts (includes ovarian and extraovarian cysts) <ul style="list-style-type: none"> • Round or oval • Anechoic • Smooth, thin walls • No solid component or septation • Posterior acoustic enhancement • No internal flow 		Reproductive age: ≤ 5 cm: Not needed > 5 & ≤ 7 cm: Yearly Postmenopausal (PM): > 1 & ≤ 7 cm: Yearly** Any age: > 7 cm: Further imaging (e.g., MRI) or surgical evaluation	Simple cysts, regardless of age of patient, are almost certainly benign For cysts ≤ 3 cm in women of reproductive age, it is at discretion of interpreting physician whether to describe them in imaging report
Hemorrhagic cyst <ul style="list-style-type: none"> • Reticular pattern of internal echoes • +/- Solid appearing area with concave margins • No internal flow 		Reproductive age: ≤ 5 cm: Not needed > 5 cm: 6-12 week follow-up to ensure resolution Early PM: Any size: Follow-up to ensure resolution Late PM: Consider surgical evaluation	Use Doppler to ensure no solid elements For cysts ≤ 3 cm in women of reproductive age, it is at the discretion of interpreting physician whether to describe them in imaging report
Endometrioma <ul style="list-style-type: none"> • Homogeneous low level internal echoes • No solid component • +/- Tiny echogenic foci in wall 		Any age: Initial follow-up 6-12 weeks, then if not surgically removed, follow-up yearly	
Dermoid <ul style="list-style-type: none"> • Focal or diffuse hyperechoic component • Hyperechoic lines and dots • Area of acoustic shadowing • No internal flow 		Any age: If not surgically removed, follow-up yearly to ensure stability	
Hydrosalpinx <ul style="list-style-type: none"> • Tubular shaped cystic mass • +/- Short round projections "beads on a string" • +/- Waist sign (i.e. indentations on opposite sides). • +/- Seen separate from the ovary 		Any age: As clinically indicated	
Peritoneal inclusion cyst <ul style="list-style-type: none"> • Follow the contour of adjacent pelvic organs • Ovary at the edge of the mass or suspended within the mass • +/- Septations 		Any age: As clinically indicated	

Note simple ovarian cysts < 5 cm in women of reproductive age do not need follow-up.

Management of Asymptomatic Ovarian and Other Adnexal Cysts Imaged at US: Society of Radiologists in Ultrasound Consensus Conference Statement Radiology 2010


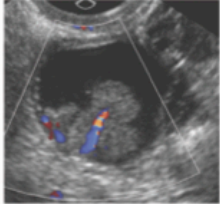
OVARIAN AND ADNEXAL CYSTS - CYSTS WITH INDETERMINATE, BUT PROBABLY BENIGN CHARACTERISTICS

Cysts with indeterminate, but probably benign, characteristics		Follow-up*	Comments
Findings suggestive of, but not classic for, hemorrhagic cyst, endometrioma or dermoid		Reproductive age: 6-12 week follow-up to ensure resolution. If the lesion is unchanged, then hemorrhagic cyst is unlikely, and continued follow-up with either ultrasound or MRI should then be considered. If these studies do not confirm an endometrioma or dermoid, then surgical evaluation should be considered. Postmenopausal: Consider surgical evaluation	
Thin-walled cyst with single thin septation or focal calcification in the wall of a cyst		Follow-up based on size and menopausal status, same as simple cyst described above	
Multiple thin septations (< 3 mm)		Consider surgical evaluation	Multiple septations suggest a neoplasm, but if thin, the neoplasm is likely benign
Nodule (non-hyperechoic) without flow		Consider surgical evaluation or MRI	Solid nodule suggests neoplasm, but if no flow (and not echogenic as would be seen in a dermoid) this is likely a benign lesion such as a cystadenofibroma

Presence of multiple thin septations or a solid avascular nodule suggests surgical evaluation required.

Management of Asymptomatic Ovarian and Other Adnexal Cysts Imaged at US: Society of Radiologists in Ultrasound Consensus Conference Statement Radiology 2010

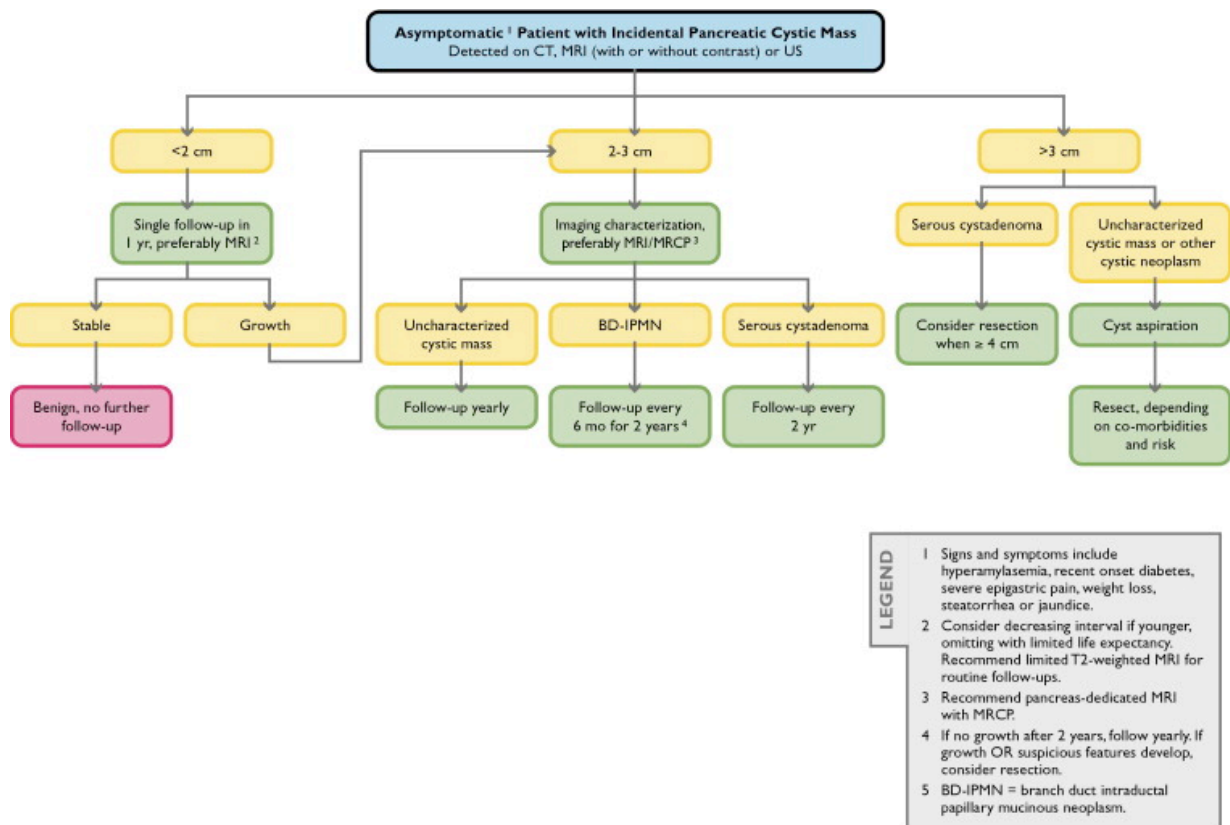
OVARIAN AND ADNEXAL CYSTS - MALIGNANT CHARACTERISTICS

Cysts with characteristics worrisome for malignancy		Follow-up*	Comments
Thick (> 3 mm) irregular septations		Any age: Consider surgical evaluation	
Nodule with blood flow		Any age: Consider surgical evaluation	

Thick (>3mm) or irregular septations and/or vascularised intracystic nodule is highly suggestive of malignancy.

Management of Asymptomatic Ovarian and Other Adnexal Cysts Imaged at US: Society of Radiologists in Ultrasound Consensus Conference Statement Radiology 2010

PANCREATIC CYSTS



1. Size criteria <2, 2-3, > 3cm
2. Don't try and characterise cystic mass < 2cm in size - 12 month follow-up.
3. 2-3cm size should be characterised with dual phase CT or MRCP
4. >3cm size, consider EUS cyst aspiration.
5. Do not mistake necrotic carcinoma for cystic neoplasm.
6. Presence of pancreatic related signs and symptoms changes the rules.

Managing Incidental Findings on Abdominal CT: White Paper of the ACR Incidental Findings Committee J Am Coll Radiol 2010;7:754-773.

PNEUMONIA - FOLLOWUP GUIDELINES

Abnormal findings on chest radiograph clear more slowly than do clinical signs of pneumonia. For those less than 50 years old, and otherwise healthy, *S. pneumoniae* pneumonia will clear radiographically by 4 wk in only 60% of patients. If the patient is older, has bacteremic pneumonia, COPD, alcoholism, or underlying chronic illness, radiographic clearing is even slower, and only 25% will have a normal radiograph at 4 wk. *Mycoplasma pneumoniae* infection can clear radiographically more rapidly than pneumococcal infection, while pneumonia due to *Legionella* sp. will clear more slowly.

The radiograph often worsens initially after therapy is started, with progression of the infiltrate and/or development of a pleural effusion. If the patient has mild or moderate pneumonia or is showing an otherwise good clinical response, this radiographic progression may have no significance. However, radiographic deterioration in the setting of severe community-acquired pneumonia has been noted to be a particularly poor prognostic feature, highly predictive of mortality

In uncomplicated pneumonia responsive to therapy, repeat radiograph is recommended during at approximately 4 to 6 wk post Rx, to establish a new radiographic baseline and to exclude the possibility of malignancy associated with community acquired pneumonia particularly in older smokers

Guidelines for the Management of Adults with Community-acquired Pneumonia American Thoracic Society Am J Respir Crit Care Med Vol 163. pp 1730–1754, 2001

PULMONARY NODULES

Recommendations for Follow-up and Management of Nodules Smaller than 8 mm Detected Incidentally at Nonscreening CT		
Nodule Size (mm)*	Low-Risk Patient†	High-Risk Patient‡
≤4	No follow-up needed§	Follow-up CT at 12 mo; if unchanged, no further follow-up¶
>4–6	Follow-up CT at 12 mo; if unchanged, no further follow-up¶	Initial follow-up CT at 6–12 mo then at 18–24 mo if no change¶
>6–8	Initial follow-up CT at 6–12 mo then at 18–24 mo if no change	Initial follow-up CT at 3–6 mo then at 9–12 and 24 mo if no change
>8	Follow-up CT at around 3, 9, and 24 mo, dynamic contrast-enhanced CT, PET, and/or biopsy	Same as for low-risk patient

Note.—Newly detected indeterminate nodule in persons 35 years of age or older.

* Average of length and width.

† Minimal or absent history of smoking and of other known risk factors.

‡ History of smoking or of other known risk factors.

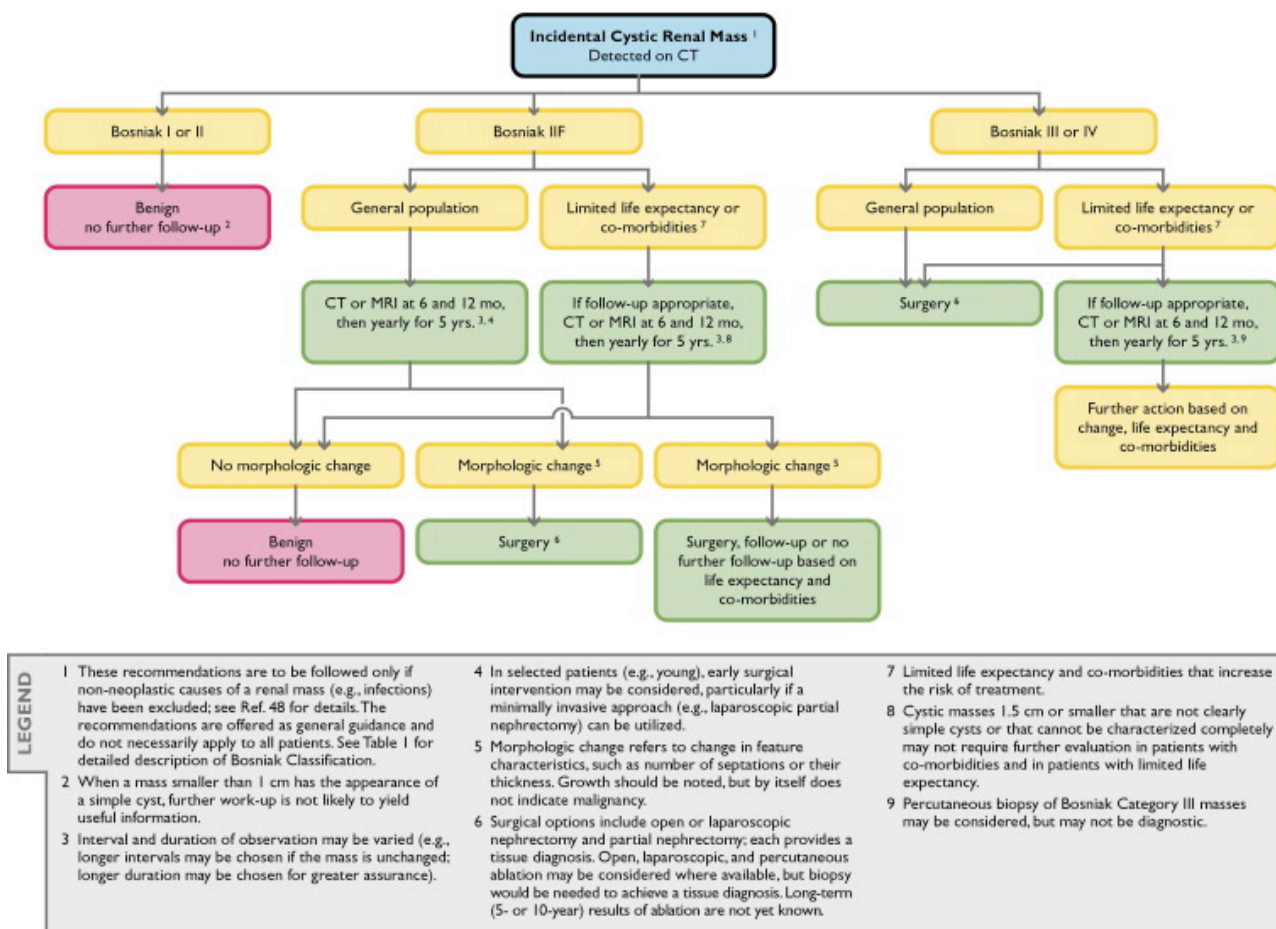
§ The risk of malignancy in this category (<1%) is substantially less than that in a baseline CT scan of an asymptomatic smoker.

¶ Nonsolid (ground-glass) or partly solid nodules may require longer follow-up to exclude indolent adenocarcinoma.

No follow-up CT required for pulmonary nodule ≤4mm in a low-risk patient.

Guidelines for the Management of Small Pulmonary Nodules Detected on Ct Scans. Macmahon et al Radiology 2005;237:395-400

RENAL MASSES - CYSTIC

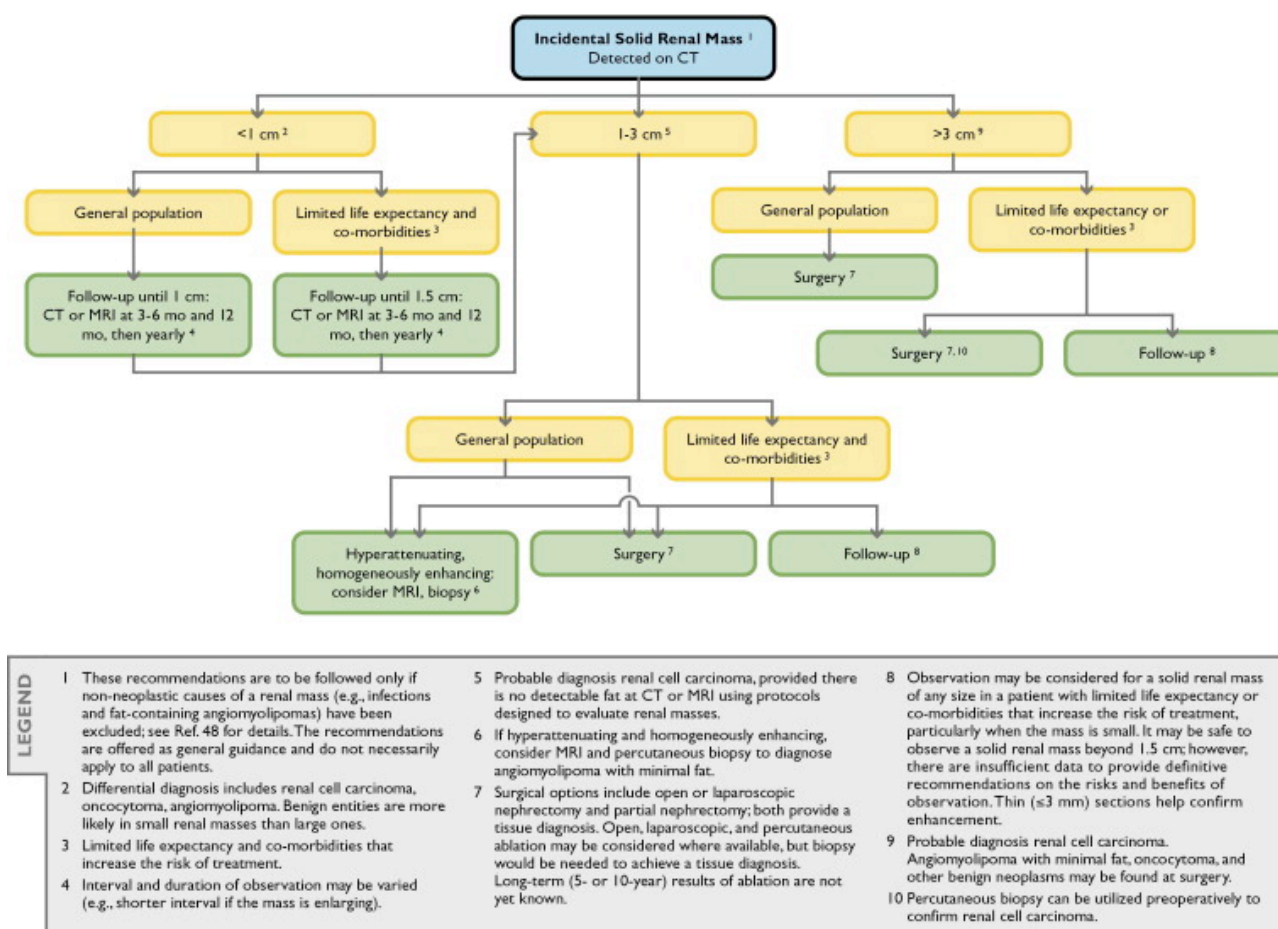


Bosniak Renal Cyst Classification System	
I	- Simple cyst with a hairline-thin wall. - No septa, calcifications, or solid components. - Water attenuation, no enhancement.
II	- Septa : few hairline-thin in which not measurable enhancement may be appreciated. - Calcification : fine or a short segment of slightly thickened may be present in the wall or septa. - High-attenuation : uniform in lesions (< 3cm) that are sharply margined and do not enhance.
IIF	- Septa : multiple hairline-thin in which not measurable enhancement of septum or wall is appreciated. - Minimal thickening of wall or septa , which may contain calcification, that may be thick and nodular, but no measurable contrast enhancement. - No enhancing soft-tissue components. - Intrarenal : totally intrarenal nonenhancing high-attenuating renal lesions; these lesions are generally well margined.
III	- Measurable enhancement Cystic mass with thickened irregular or smooth walls or septa in which measurable enhancement is present
IV	- Enhancing soft-tissue components Clearly malignant cystic masses that can have all of the criteria of category III but also contain distinct enhancing soft-tissue components independent of the wall or septa

	Ignore	Follow	Excise
Calcification	small smooth, septal milk of calcium	thick nodular	enhancement nodular and wall thickening
Hyperdens	sharp margin < 3 cm not completely intrarenal, homogeneous US: cystic	totally intra-renal, > 3 cm + no enhancing	poorly defined heterogeneous enhancement US: solid
Septations	Thin and smooth	Slightly greater than a hairline	Thick, irregular, nodular enhancement
Enhancement	< 10 HE	10 -15 HE	> 15 HE *
Multiloculated	—	—	All* * unless infection
Nodularity	—	Very small nonenhancing nodules	All others
Wall thickening			All* unless infection

Managing Incidental Findings on Abdominal CT: White Paper of the ACR Incidental Findings Committee *J Am Coll Radiol* 2010;7:754-773. <http://www.radiologyassistant.nl>

RENAL MASSES - SOLID



1. Size criteria <1, 1-3, >3cm

2. Consider minimal fat content angiomyolipoma if hyperenhancing homogeneous solid mass.

Managing Incidental Findings on Abdominal CT: White Paper of the ACR Incidental Findings Committee *J Am Coll Radiol* 2010;7:754-773.

VASCULAR

Abdominal Aortic Aneurysms

3.0-3.9cm diameter : Annual US surveillance recommended

4.0-4.9cm diameter : 6 month US surveillance recommended

5.0+cm : Recommendation for elective aneurysm repair in appropriate surgical candidates

ACC/AHA 2005 Practice Guidelines for the Management of Patients With Peripheral Arterial Disease pp 582

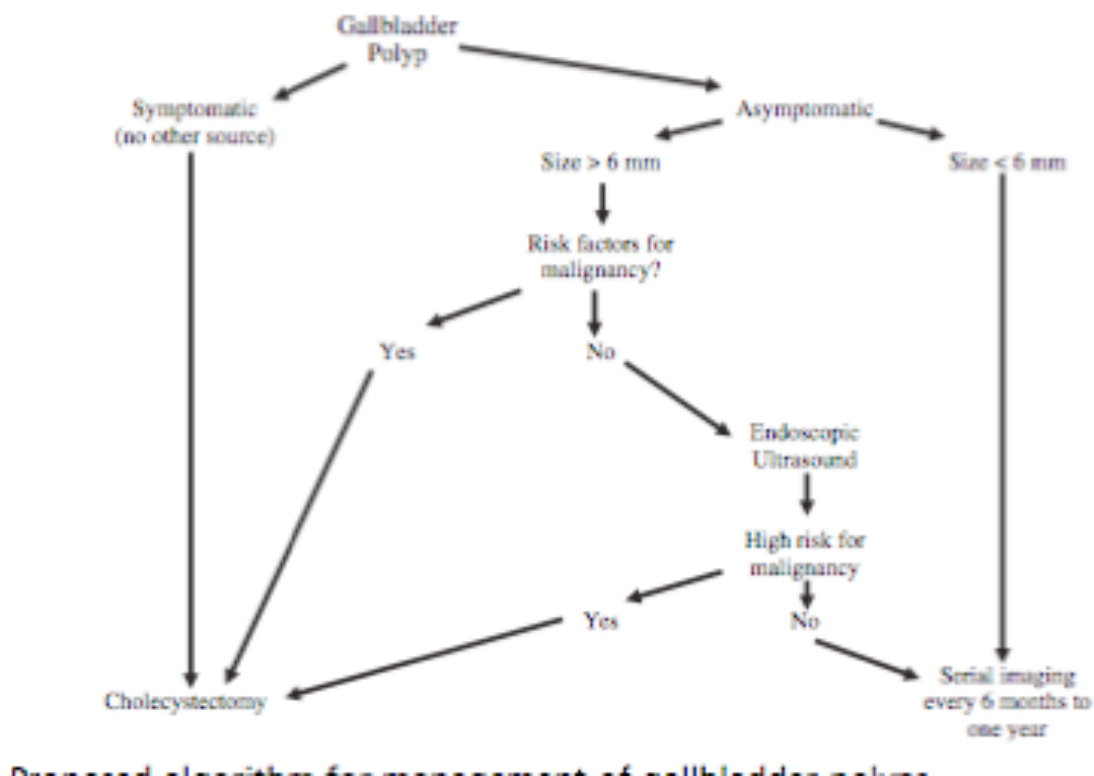
Visceral Artery Aneurysms (Splenic, renal, mesenteric)

Open repair or catheter-based intervention is indicated for visceral aneurysms measuring 2.0 cm in diameter or larger in women of childbearing age who are not pregnant and in patients of either gender undergoing liver transplantation. (Level of Evidence: B)

Open repair or catheter-based intervention is probably indicated for visceral aneurysms 2.0 cm in diameter or larger in women beyond childbearing age and in men. (Level of Evidence: B)

Risk of rupture splenic artery aneurysm very low for small (<2.0cm aneurysm) in post-menopausal woman

ACC/AHA 2005 Practice Guidelines for the Management of Patients With Peripheral Arterial Disease pp 600

GALLBLADDER POLYPS**Risk Factors for Malignancy**

1. age over 60,
2. sessile morphology,
3. size > 10mm,
4. solitary sessile lobulated polyp,
5. background of primary sclerosing cholangitis

Polyps not resected should be followed with serial ultrasound examinations. Clear guidelines for screening are not available and individual patient characteristics need to be considered. Recent studies suggest US screening interval of every 6-12 months continued for as long as 10 years.

New research suggests EUS may be of benefit in further characterisation.

Diagnosis and Management of Gallbladder Polyps Gallahan WC and Conway JD Gastroenterol Clin N Am 39 (2010) 359–367

See INTRANET for electronic copy and cited references.

<http://share.bensonradiology.com.au>

Look for Radiologist Folder

Look for “Management Recommendations”

(accessed from inside Benson Radiology Computer Network)