IMAGING, SCREENING & INCIDENTAL FINDINGS

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WHY THIS MATTERS

Imaging drives clinical decisions

Incidental findings common (>30%)

Overuse leads to harm and cost

Goal: guideline-based care

LEARNING OBJECTIVES

Apply ACR incidental findings guidance

Understand evidence-based screening

Recognize when NOT to image

Reduce unnecessary follow-up

FLEISCHNER 2017 GUIDELINES

Management of incidental pulmonary nodules

Applies to adults >35 years

Excludes cancer, immunocompromised, screening

Fleischner 2017 Pulmonary Nodule Guidelines (Quick Table)

Category	Low Risk	High Risk
Single solid <6 mm	None	Optional CT 12 mo
Single solid 6–8 mm	CT 6–12 mo → consider 18–24 mo	CT 6–12 mo + 18–24 mo
Single solid >8 mm	CT 3 mo / PET-CT / biopsy	Same
Multiple solid <6 mm	None	Optional CT 12 mo
Multiple solid ≥6 mm	CT 3–6 mo → consider 18–24 mo	CT 3–6 mo + 18–24 mo
Subsolid nodules ≥6 mm	CT 6–12 mo or 3–6 mo → long-term follow-up	Same

RISK STRATIFICATION

High risk >5% malignancy

Factors: older age, smoking, spiculation, upper lobe

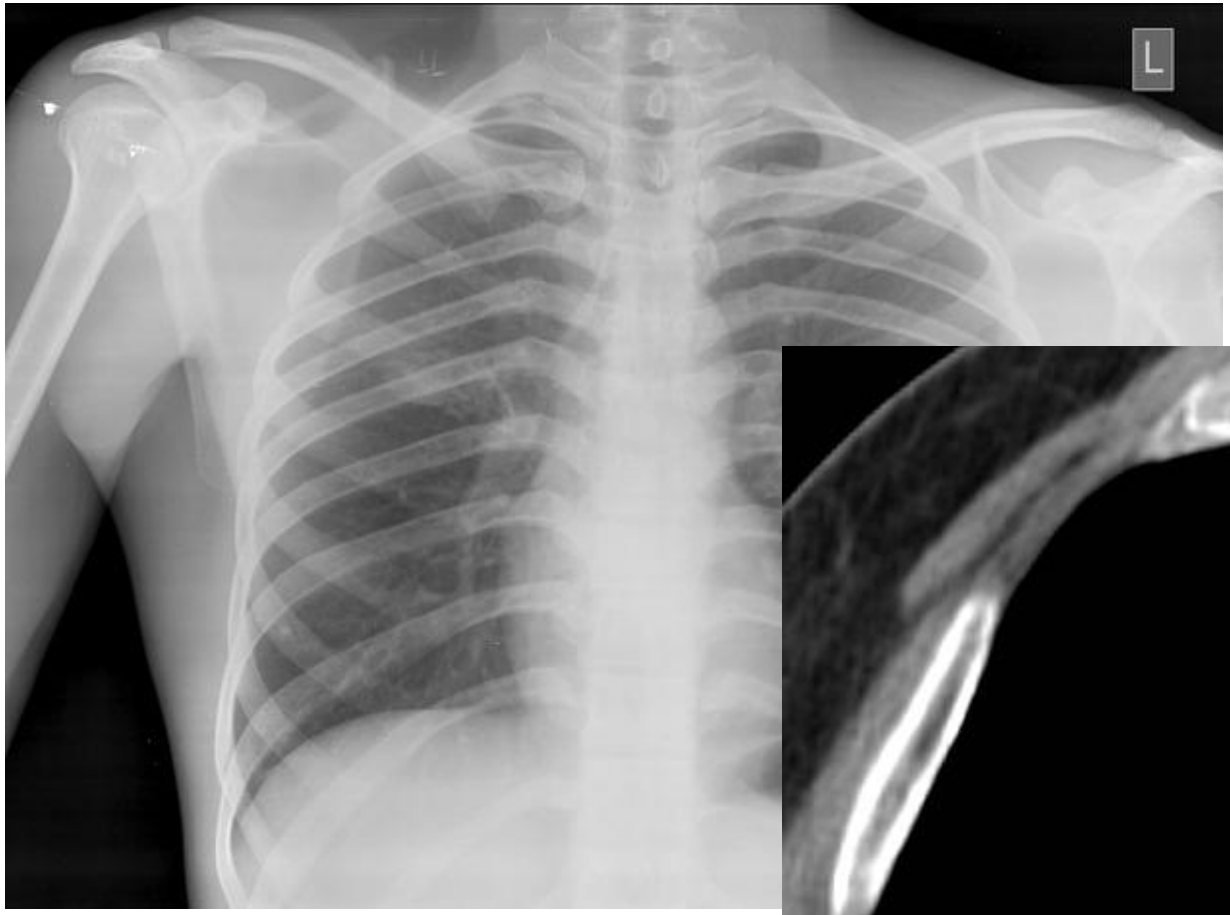
Low risk: none of these features

SINGLE SOLID NODULES

<6 mm: none (low), optional CT 12 mo (high)

6–8 mm: CT 6–12 mo ± 18–24 mo

>8 mm: CT 3 mo / PET-CT / biopsy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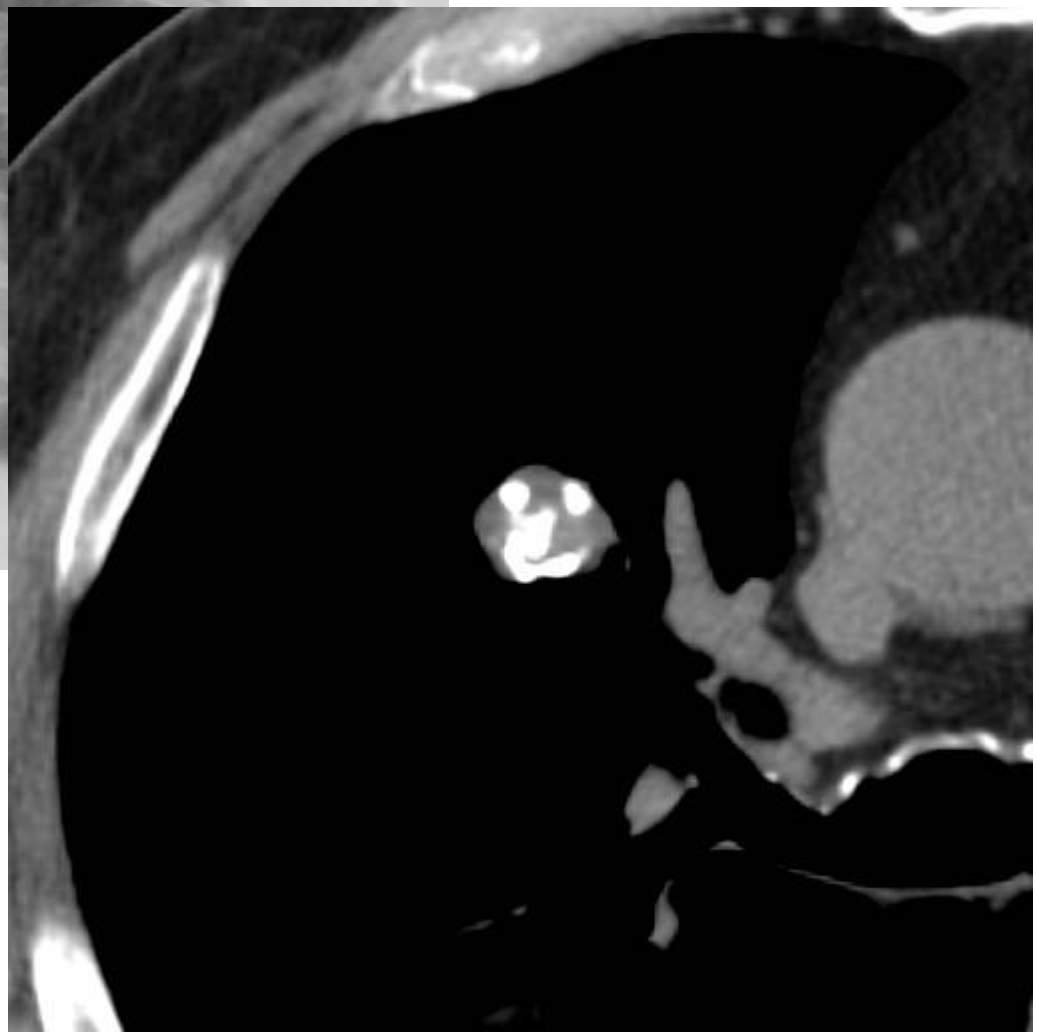


MULTIPLE SOLID NODULES

<6 mm: none (low), optional 12 mo (high)

6–8 mm: CT 3–6 mo ± 18–24 mo

>8 mm: CT 3–6 mo + 18–24 mo

Manage by most suspicious nodule

SUBSOLID NODULES

Ground glass <6 mm: none

Ground glass ≥6 mm: CT then q2yr up to 5 yr

Part-solid ≥6 mm: CT 3–6 mo then annual if stable

MULTIPLE SUBSOLID NODULES

<6 mm: CT 3–6 mo, consider longer follow-up

>=6 mm: CT 3–6 mo

Guide by most suspicious lesion

RED FLAGS

Growth ≥2 mm

Solid component ≥6 mm

Spiculated margins

Increasing density

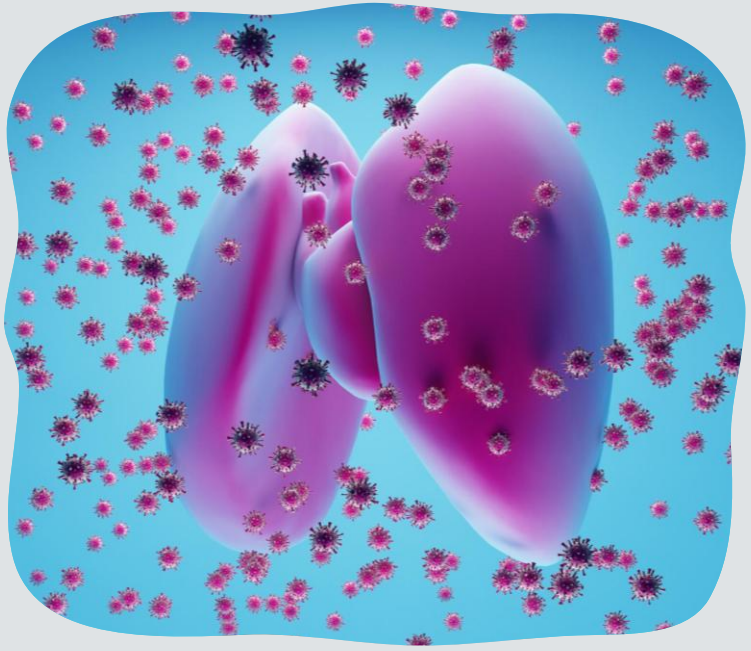
BRONCHOGENIC CARCINOMA OVERVIEW

- Primary lung cancers linked to inhaled carcinogens
- Two main types:
  - NSCLC (80%)
  - SCLC (20%)

NSCLC Subtypes:

- Adenocarcinoma (35%): most common, peripheral, common in women/non-smokers
- Squamous cell (30%): smoking-related, cavitation, poorer prognosis
- Large cell (15%): peripheral, large (>4 cm), aggressive

HIGHLY TREATABLE NSCLC SUBTYPES WITH ACTIONABLE MUTATIONS



ALK-Rearranged NSCLC

ALK-rearranged NSCLC shows excellent treatment response with ALK inhibitors, offering median survival of 40–50 months.

EGFR-Mutated NSCLC

EGFR-mutated NSCLC responds well to tyrosine kinase inhibitors improving survival and response rates significantly.

Other Actionable Mutations

Rare NSCLC subtypes like ROS1, RET, BRAF, MET, and NTRK mutations have FDA-approved targeted treatments.

Importance of Molecular Testing

Comprehensive molecular testing at diagnosis is crucial to identify actionable mutations and optimize treatment.

SMALL CELL LUNG CANCER (SCLC)

- Almost always in smokers
- Rapid growth and early metastasis
- Highly aggressive tumor

Clinical features:

- Paraneoplastic syndromes
- Superior vena cava (SVC) obstruction

- Worst prognosis among lung cancers

KEY TAKEAWAYS

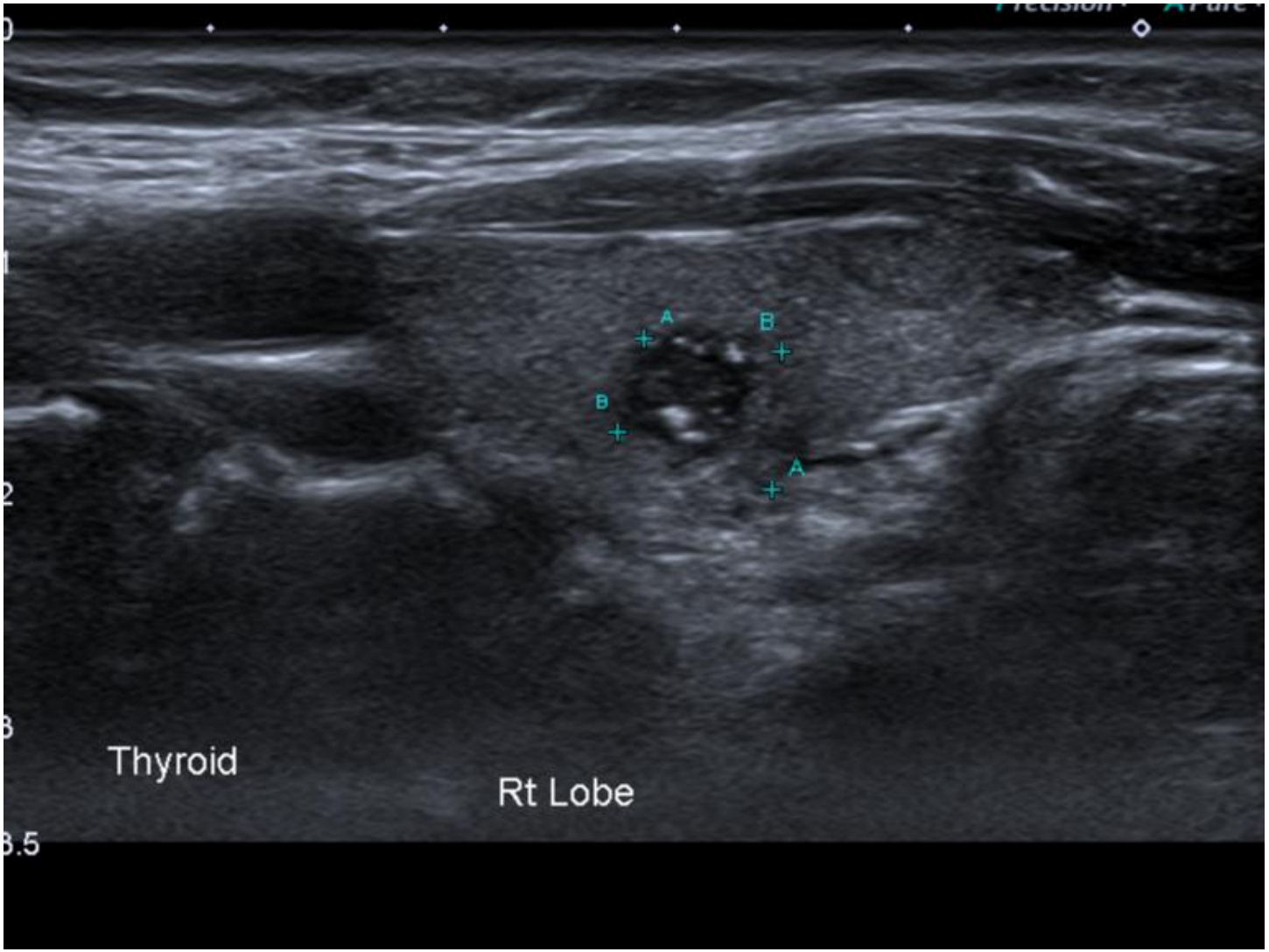
<6 mm usually benign

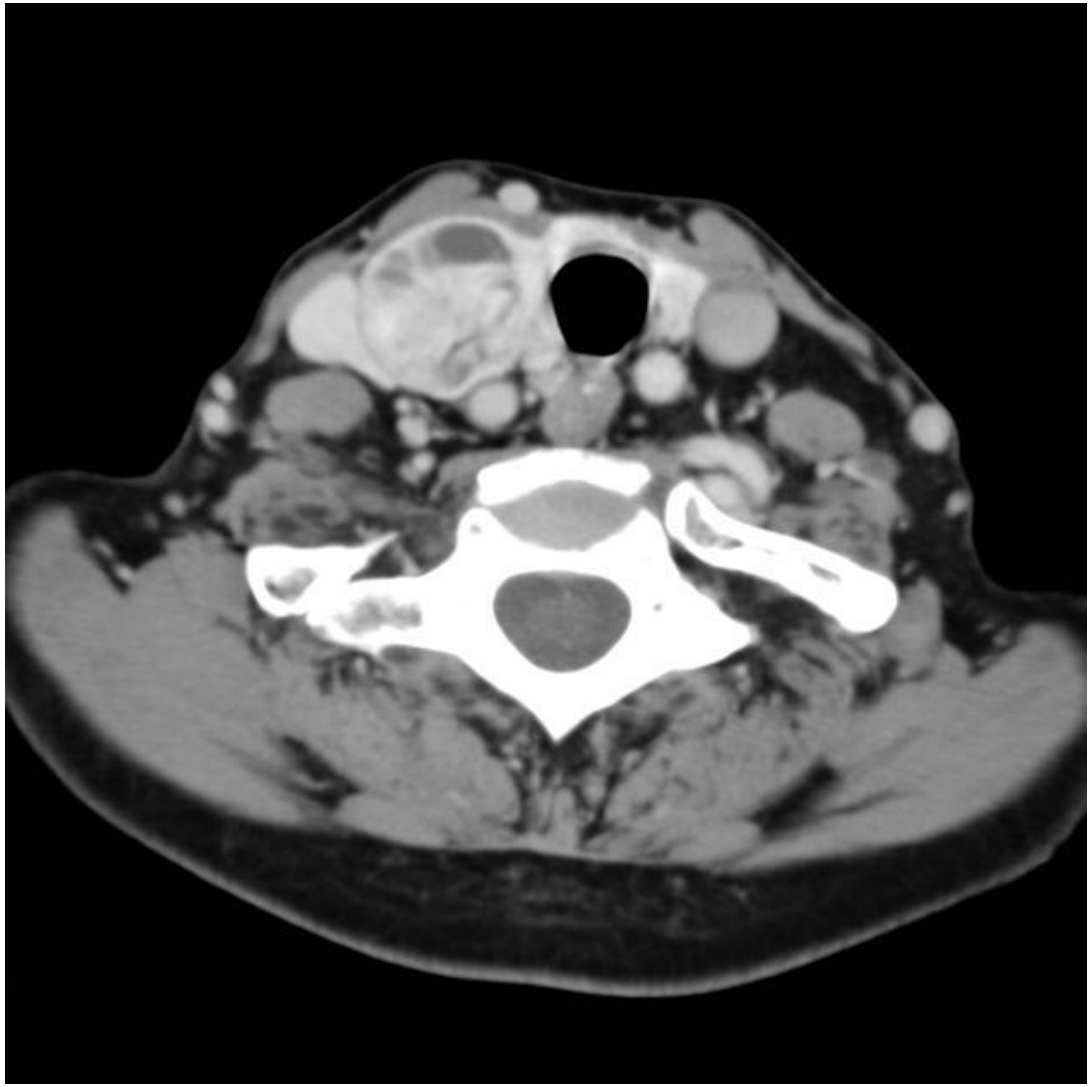
>8 mm → aggressive evaluation

Subsolid nodules need long follow-up

Always risk stratify

Thyroid Nodules and TIRADS





ACR TI-RADS

COMPOSITION
(Choose 1)

Cystic or almost completely cystic	0 points
Spongiform	0 points
Mixed cystic and solid	1 point
Solid or almost completely solid	2 points

ECHOGENICITY
(Choose 1)

Anechoic	0 points
Hyperechoic or isoechoic	1 point
Hypoechoic	2 points
Very hypoechoic	3 points

SHAPE
(Choose 1)

Wider-than-tall	0 points
Taller-than-wide	3 points

MARGIN
(Choose 1)

Smooth	0 points
Ill-defined	0 points
Lobulated or irregular	2 points
Extra-thyroidal extension	3 points

ECHOGENIC FOCI
(Choose All That Apply)

None or large comet-tail artifacts	0 points
Macrocalcifications	1 point
Peripheral (rim) calcifications	2 points
Punctate echogenic foci	3 points

Add Points From All Categories to Determine TI-RADS Level

0 Points	2 Points	3 Points	4 to 6 Points	7 Points or More
TR1	**TR2**	**TR3**	**TR4**	**TR5**
Benign	**Not Suspicious**	**Mildly Suspicious**	**Moderately Suspicious**	**Highly Suspicious**
No FNA	No FNA	FNA if ≥ 2.5 cm Follow if ≥ 1.5 cm	FNA if ≥ 1.5 cm Follow if ≥ 1 cm	FNA if ≥ 1 cm Follow if ≥ 0.5 cm*

COMPOSITION	ECHOGENICITY	SHAPE	MARGIN	ECHOGENIC FOCI
Spongiform: Composed predominantly (>50%) of small cystic spaces. Do not add further points for other categories. *Mixed cystic and solid:* Assign points for predominant solid component. Assign 2 points if composition cannot be determined because of calcification.	*Anechoic:* Applies to cystic or almost completely cystic nodules. *Hyperechoic/isoechoic/hypoechoic:* Compared to adjacent parenchyma. *Very hypoechoic:* More hypoechoic than strap muscles. Assign 1 point if echogenicity cannot be determined.	*Taller-than-wide:* Should be assessed on a transverse image with measurements parallel to sound beam for height and perpendicular to sound beam for width. This can usually be assessed by visual inspection.	*Lobulated:* Protrusions into adjacent tissue. *Irregular:* Jagged, spiculated, or sharp angles. *Extrathyroidal extension:* Obvious invasion = malignancy. Assign 0 points if margin cannot be determined.	*Large comet-tail artifacts:* V-shaped, >1 mm, in cystic components. *Macrocalcifications:* Cause acoustic shadowing. *Peripheral:* Complete or incomplete along margin. *Punctate echogenic foci:* May have small comet-tail artifacts.

**Refer to discussion of papillary microcarcinomas for 5-9 mm TR5 nodules.*

CLASSIFICATION OF THYROID CANCER

Well-differentiated thyroid cancer (~90%)

- Papillary thyroid carcinoma (~80–85%)
- Follicular thyroid carcinoma (~5%)
- Oncocytic (Hürthle cell) carcinoma (~2%)

More aggressive differentiated subtypes (~5%)

- High-grade differentiated thyroid carcinoma
- Poorly differentiated thyroid carcinoma

Other distinct thyroid malignancies

- Medullary thyroid carcinoma (~4%)
- Anaplastic thyroid carcinoma (~1%)

TI-RADS: RISK = SCORE

Points assigned for 5 features:

- Composition
- Echogenicity
- Shape
- Margins
- Echogenic foci

Total points → TR1–TR5 risk category

TI-RADS: CATEGORIES GUIDE MANAGEMENT

TR1–TR2: No biopsy, no follow-up

TR3: Biopsy ≥2.5 cm

TR4: Biopsy ≥1.5 cm

TR5: Biopsy ≥1.0 cm

Higher category = higher cancer risk

TI-RADS: SIZE THRESHOLDS MATTER

Avoid biopsy in small nodules

Follow instead of biopsy when below size cutoff

No action for very small nodules

Prevents overdiagnosis and overtreatment

TI-RADS: HIGH-RISK FEATURES

Taller-than-wide shape

Irregular or lobulated margins

Microcalcifications

Extrathyroidal extension

These drive higher TR scores and earlier biopsy

PAROTID GLAND TUMORS – OVERVIEW

- Most common salivary gland tumors occur in parotid
- ~70% benign; majority of malignant salivary tumors also arise here
- Typically middle-aged patients; rare in children
- Warthin tumor: elderly men, smoking association

CLINICAL PRESENTATION & PATHOLOGY

- Painless preauricular mass most common
- Facial nerve symptoms (pain, weakness) → suspicious for malignancy
- Benign: Pleomorphic adenoma (most common), Warthin tumor
- Malignant: Mucoepidermoid (most), adenoid cystic, acinic cell
- Nodal/metastatic disease can occur (SCC, melanoma, lymphoma)

RADIOGRAPHIC FEATURES

- CT: good for bony invasion and extent
- MRI: best for perineural spread and soft tissue detail
- Ultrasound: limited diagnostic role, useful for biopsy guidance
- PET-CT: detects distant nodal/metastatic disease (limited specificity)

KEY HIGH-YIELD PEARLS

- Facial nerve involvement = red flag for malignancy
- Warthin tumor almost exclusive to parotid
- Most tumors benign but malignancy still common overall
- Imaging choice: MRI for nerves, CT for bone

INCIDENTAL LIVER LESIONS (ACR) – PCP FOCUS

- Very common on CT; most are benign
- First step: assess patient risk
  - Low risk: no cancer, no liver disease
  - High risk: cancer or cirrhosis
- Core goal: avoid over-testing but detect significant disease

MANAGEMENT APPROACH (LOW-RISK PATIENTS)

- Classic benign lesions (cyst, hemangioma, FNH) → NO follow-up
- Indeterminate lesions:
  - ≤1.5 cm → usually benign → no workup
  - 1.5–3 cm → MRI with contrast
  - >3 cm → MRI + consider referral
- MRI = best test for characterization

HIGH-RISK PATIENTS & RED FLAGS

- Known cancer → consider metastasis
- Cirrhosis → risk for HCC (use LI-RADS)
- Any indeterminate lesion → further imaging (MRI/CT)
- Red flags: growth, irregular margins, enhancement + washout
- Refer to hepatology/oncology if suspicious

ADRENAL MASSES: PRIMARY CARE OVERVIEW

- Common incidental finding on imaging (incidentaloma)
- Most are benign (adrenocortical adenomas)
- Evaluate for: malignancy risk + hormone activity
- Key question: functional vs non-functional

COMMON ADRENAL TUMORS

Benign:

- Adenoma – most common, usually asymptomatic
- Pheochromocytoma – catecholamine-secreting

Malignant:

- Adrenocortical carcinoma – rare, aggressive
- Malignant pheochromocytoma – metastatic potential

WHEN TO SUSPECT A PROBLEM

Hormone symptoms:

- Cushing: weight gain, easy bruising
- Conn: hypertension + hypokalemia
- Pheo: episodic headache, sweating, palpitations

Malignancy clues:

- Unexplained weight loss, pain
- Rapid growth or large mass

INCIDENTAL ADRENAL MASS (ACR) – PCP APPROACH

- Most are benign adenomas
- First step: check CT density (HU)
  - ≤10 HU → benign → no imaging follow-up
  - >10 HU → further imaging (CT washout or MRI)
- Size matters:
  - <4 cm → usually benign → characterize
  - ≥4 cm → refer for surgery
- Growth (>1 cm/year) → refer

PCP CHECKLIST & RED FLAGS

- Always assess hormonal function:
  - Cushing (cortisol)
  - Conn (aldosterone if HTN/hypokalemia)
  - Pheochromocytoma (metanephrines)
- Rule out pheochromocytoma BEFORE biopsy
- No follow-up needed if:
  - Lipid-rich adenoma (≤10 HU)
  - Myelolipoma or simple cyst
- Known cancer → consider metastasis (PET/biopsy)

BOTTOM LINE:

≤10 HU = benign | ≥4 cm or growing = refer

PRIMARY CARE APPROACH

- Initial workup:
  - Hormonal testing (cortisol, aldosterone, catecholamines)
  - Imaging review (size, growth)

- Refer if:
  - Functional tumor
  - >4 cm or suspicious features

- Most small, nonfunctional adenomas → monitor

STEP 1: IDENTIFY BENIGN VS CYSTIC

Simple cyst:

- −10 to +10 HU, thin wall, no enhancement
- → No follow-up

Cystic lesions (Bosniak):

- I/II → none
- IIF → surveillance
- III/IV → refer to urology

STEP 2: SOLID LESIONS (SIZE-BASED)

- <1 cm → active surveillance
- 1–4 cm → urology referral
- >4 cm → high risk → urgent referral

Key: enhancement >20 HU = suspicious

RED FLAGS & SPECIAL LESIONS

Red flags:

- Enhancement
- Irregular borders/nodules
- Growth

Angiomyolipoma (fat-containing):

- <4 cm → observe
- >4 cm → refer

ACTION SUMMARY

Refer if:

- Solid ≥1 cm
- Bosniak III/IV
- Enhancing lesion
- AML >4 cm

Observe if:

- Simple cyst
- Small (<1 cm) stable lesion

Always consider patient age & comorbidities

CARDIOVASCULAR SCREENING

Risk-based approach

BP, lipids, diabetes screening

Use ASCVD risk calculator

IMAGING IN HEART DISEASE

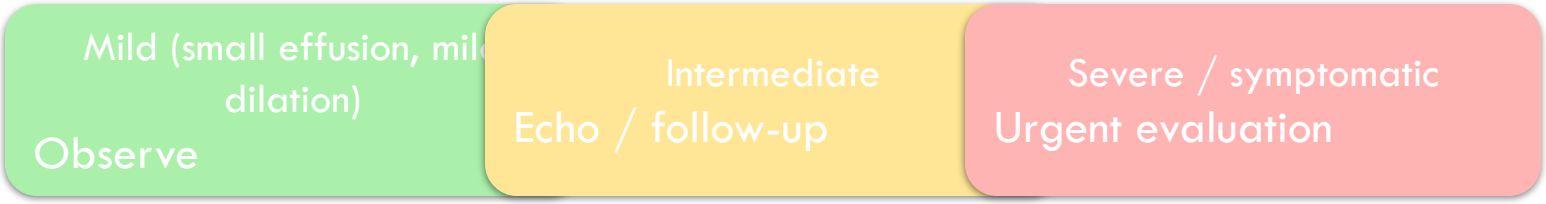
Coronary Calcification for selected patients

Avoid routine imaging in low risk patients

Mediastinal Lymph Nodes (Incidental)

Coronary Artery Calcification (CAC)

Incidental Cardiovascular Findings



CAROTID STENOSIS SCREENING (USPSTF)

- USPSTF recommends AGAINST screening asymptomatic adults (Grade D)
- Applies to patients WITHOUT prior stroke/TIA or neurologic symptoms
- Harms of screening outweigh benefits

KEY CLINICAL POINTS

- Prevalence is low in general population
- Risk factors: age, smoking, HTN, diabetes, hyperlipidemia
- No reliable method to identify who benefits from screening
- Bruit auscultation is NOT useful

MANAGEMENT APPROACH

- Focus on medical management of atherosclerosis:
  - Statins, antiplatelets
  - Control BP, diabetes
  - Lifestyle modification

- Surgery/stenting NOT beneficial for asymptomatic patients in most cases

SRU ICA Stenosis Criteria (Ultrasound)

Stenosis	PSV (cm/s)	ICA/CCA Ratio	EDV (cm/s)
Normal	<125 (no plaque)	<2	<40
<50%	<125 + plaque	<2	<40
50–69%	125–230	2–4	40–100
≥70%	>230	>4	>100

SRU KEY POINTS

- PSV threshold 125 & 230 cm/s are key cutoffs
- Always combine with plaque + grayscale narrowing
- ICA/CCA ratio improves accuracy
- EDV helps distinguish ≥70% stenosis
- Higher PSV above 230 → more severe disease

HCC SCREENING

Screen cirrhosis patients

Ultrasound ± AFP

Every 6 months

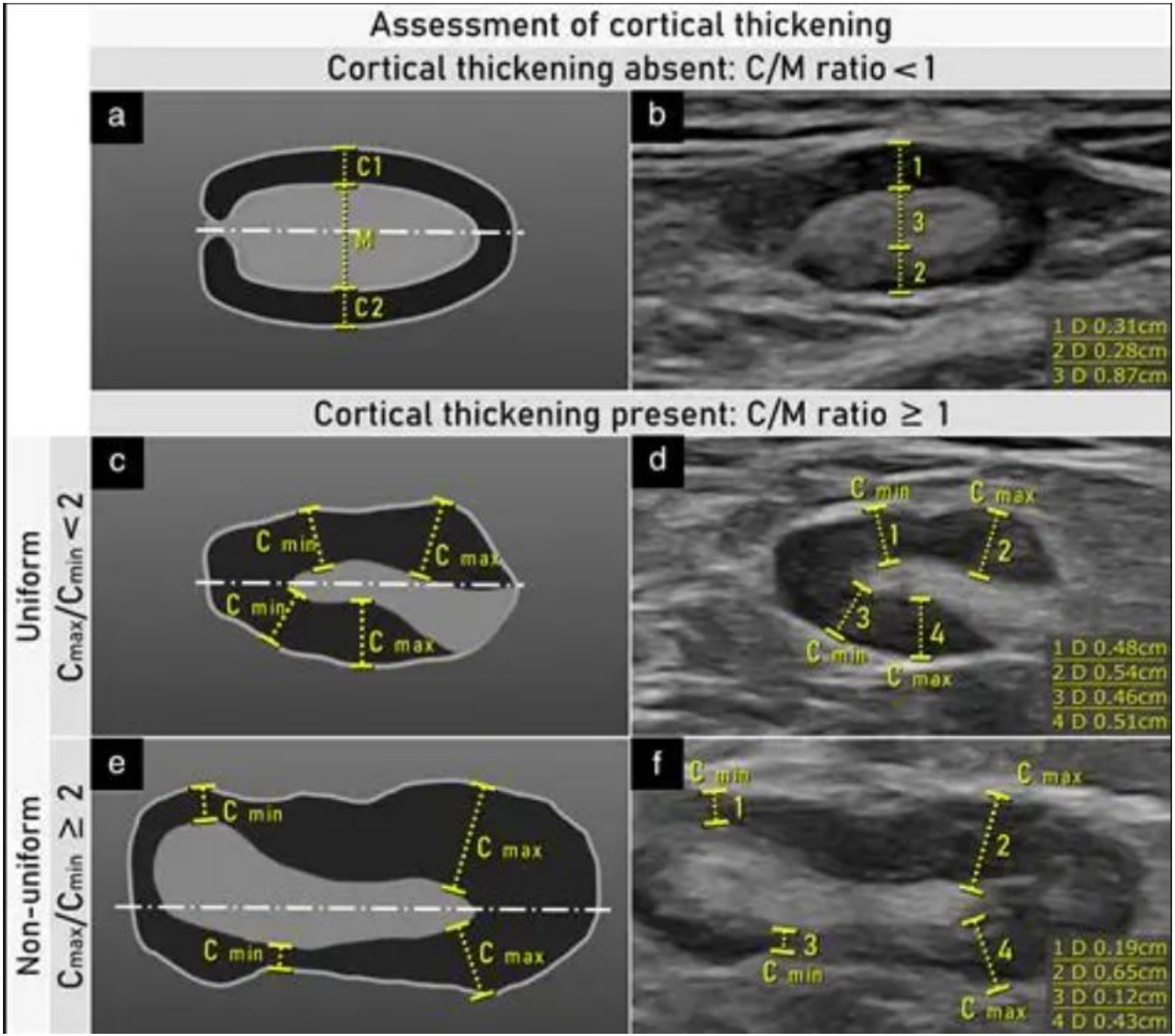
MANAGING LYMPH NODES

Lymph Nodes on Ultrasound: Normal vs Abnormal

Feature	Normal	Abnormal / Malignant
Shape	Oval, L/S ratio ~2:1	Round, L/S ratio ~1:1
Size (short axis)	<1 cm	>1 cm (enlarged)
Hilum	Present, echogenic	Absent / lost
Texture	Homogeneous	Heterogeneous, irregular
Borders	Smooth, well-defined	Irregular / poorly defined

Suspicious features: Increased vascularity, calcifications, necrosis → consider biopsy / further evaluation

Infection related lymph nodes – BY FAR MOST COMMON


Assessment of cortical thickening
Cortical thickening absent: C/M ratio < 1
a
C1
M
C2
b
1
3
2
1 D 0.31cm
2 D 0.28cm
3 D 0.87cm
Cortical thickening present: C/M ratio ≥ 1
Uniform
Cmax/Cmin < 2
c
C min
C max
C min
C max
d
C min
C max
1
2
3
4
C min
C max
1 D 0.48cm
2 D 0.54cm
3 D 0.46cm
4 D 0.51cm
Non-uniform
Cmax/Cmin ≥ 2
e
C min
C max
C min
C max
f
C min
1
C max
2
3
C min
4
C max
1 D 0.19cm
2 D 0.65cm
3 D 0.12cm
4 D 0.43cm

ABDOMINAL LYMPH NODES – KEY RULES

- <10 mm → normal, no follow-up
- 10–19 mm → repeat CT in 3 months
- ≥20 mm → biopsy or PET-CT
- Suspicious features (necrosis, irregular, cluster) → biopsy regardless of size
- Known malignancy → lower threshold for workup

SPLENIC LESIONS – MANAGEMENT

- Simple cyst <2 cm → NO follow-up
- Hemangioma (classic imaging) → NO follow-up
- Indeterminate <1 cm → repeat imaging (3–6 months)
- ≥1 cm or suspicious features → MRI / referral
- Splenomegaly → clinical workup (CBC, LFTs), not imaging

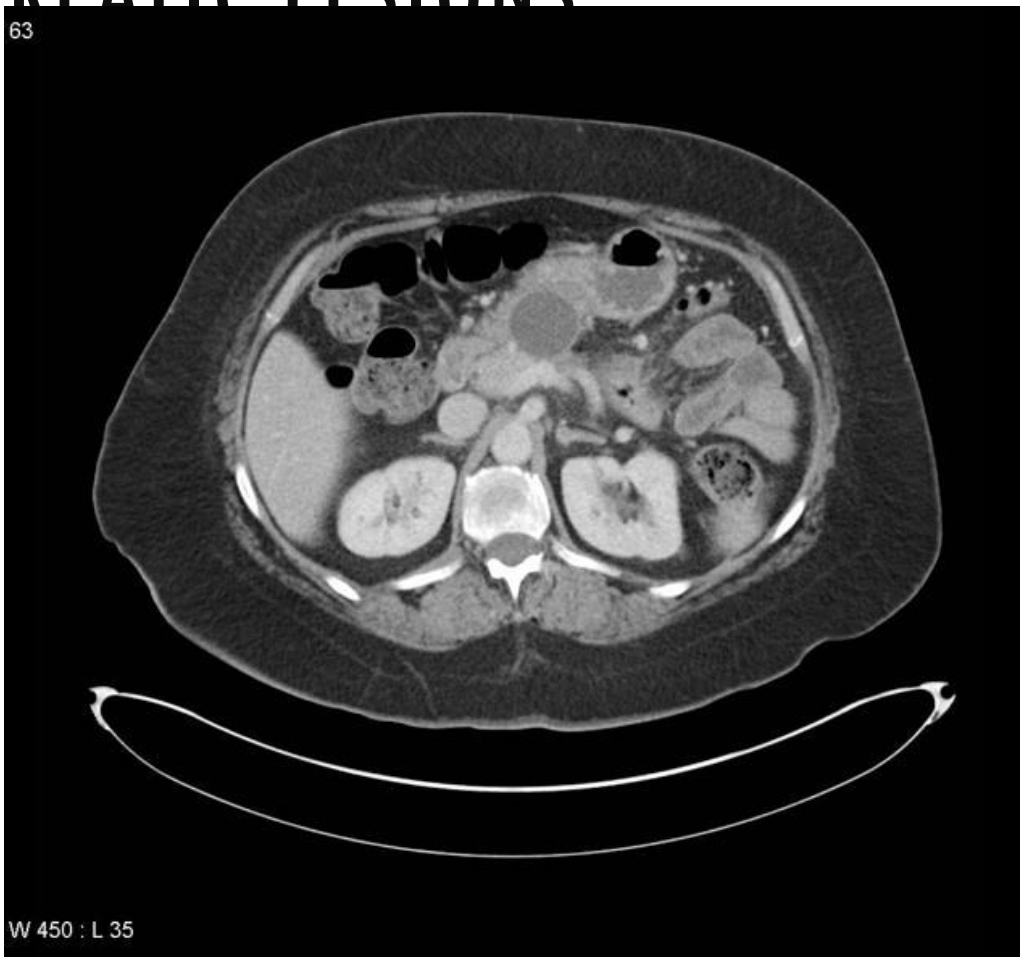
PANCREATIC CANCER SCREENING

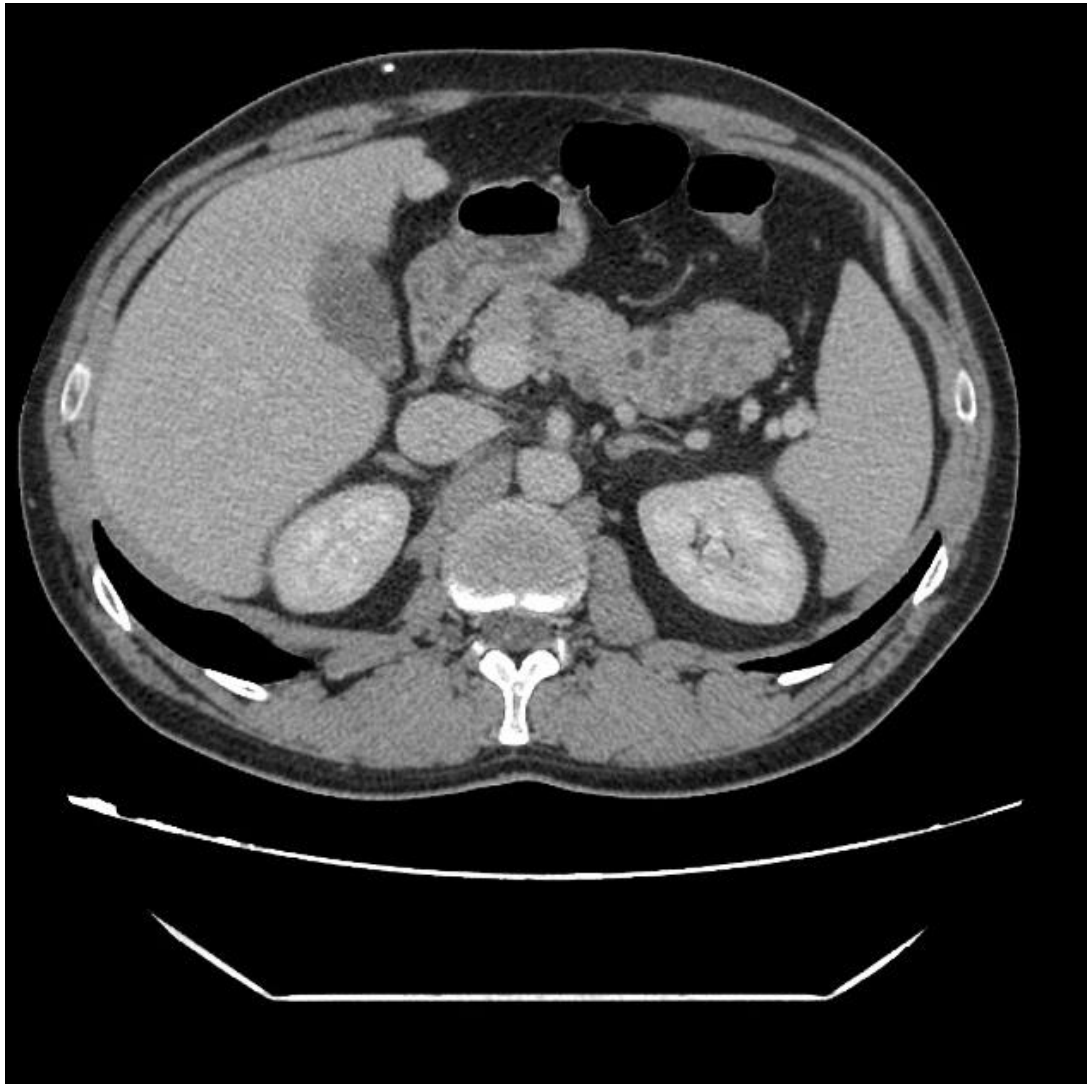
No screening for general population

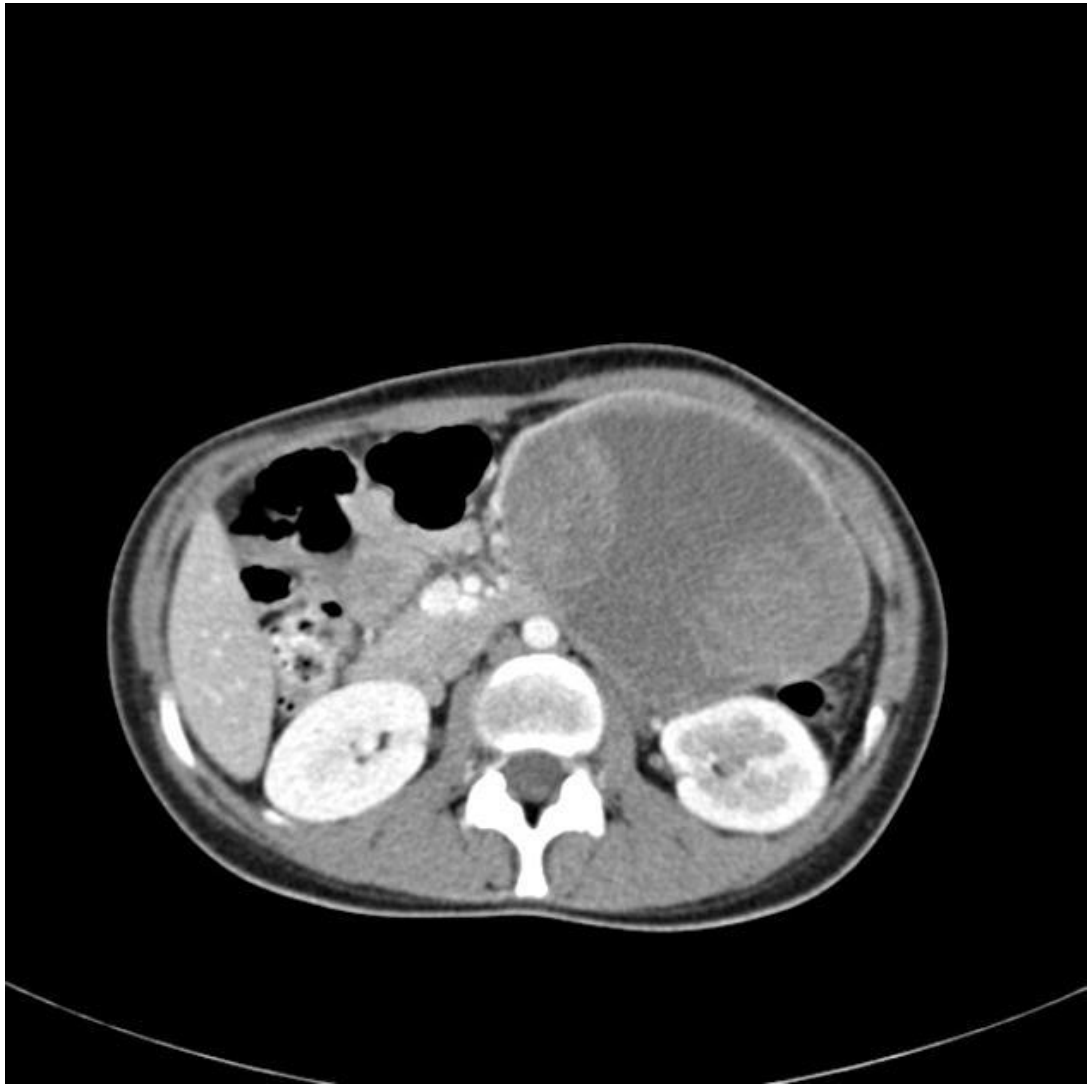
Screen only high-risk patients

MRI/EUS for screening

PANCREATIC LESIONS







Solid lesions may be difficult to differentiate on morphology alone.

• The most important questions in the approach to solid lesions in the pancreas involve differentiation of:
• Pseudolesions from true lesions
• Benign versus malignant lesions
• Adenocarcinomas from nonadenocarcinomas
• Resectable versus nonresectable neoplasms

MRI with Contrast OR CT with contrast

Ultrasound is almost useless

INCIDENTAL PITUITARY FINDINGS (ACR) – PCP APPROACH

- Common incidental finding; most are benign microadenomas
- First step: CT finding → obtain dedicated pituitary MRI
- Key questions:
  - Size of lesion
  - Mass effect (optic chiasm)
  - Hormonal function

SIZE-BASED MANAGEMENT

- <6 mm → no follow-up
- 6–9 mm → repeat MRI at 1 year, stop if stable
- ≥10 mm (macroadenoma) → endocrinology referral
  - Repeat MRI at 6 months
- ≥30 mm or optic chiasm compression → urgent referral

PCP CHECKLIST & RED FLAGS

- Screen hormones in macroadenomas:
  - Prolactin, cortisol, IGF-1, TSH, gonadal hormones
- Visual symptoms → urgent evaluation
- Growth on imaging → refer
- Most small lesions do NOT require follow-up

BOTTOM LINE:

<6 mm = ignore | ≥10 mm = refer

PCP FLOWCHART: PITUITARY INCIDENTALOMA

Incidental lesion (CT/MRI)

↓

CT? → MRI

↓

Size?

- <6 mm → no follow-up
- 6–9 mm → MRI in 1 year
- ≥10 mm → endocrinology referral

↓

Red flags? (vision, hormones) → urgent referral

INCIDENTAL ADNEXAL FINDINGS (ACR) – PCP APPROACH

- Very common finding on CT/MRI; most are benign
- Key decision factors: menopausal status, size, imaging features
- Goal: avoid unnecessary follow-up while detecting malignancy
- Core rule: Simple cysts usually need NO follow-up

SIMPLE CYSTS — SIZE-BASED MANAGEMENT

Premenopausal:

- ≤5 cm → NO follow-up
- >5 cm → consider US follow-up

Postmenopausal:

- ≤3 cm → NO follow-up
- >3 cm → US follow-up

Key concept:

- Lower threshold in postmenopausal women

INDETERMINATE & HIGH-RISK FEATURES

- Complex cyst or solid mass → further imaging (US/MRI)
- Suspicious features:
  - Solid component
  - Thick septations
  - Enhancing nodules
- ≥10 cm mass → evaluate regardless
- Refer to gynecology if suspicious

PCP FLOWCHART: ADNEXAL INCIDENTAL FINDING

Incidental adnexal mass

↓

Simple cyst?

YES → apply size rules → often STOP

NO → further imaging

↓

Suspicious features?

YES → refer

↓

Large (>10 cm)? → evaluate

INCIDENTAL VASCULAR FINDINGS (ACR) – PCP APPROACH

- Common on CT; often asymptomatic but clinically important
- Unlike other incidental findings, many require action
- Core approach: identify type → apply size thresholds → decide follow vs refer
- Major categories: aortic aneurysm, visceral aneurysm, venous findings

AORTIC & ILIAC ANEURYSMS (KEY PCP GUIDANCE)

- AAA size thresholds:
  - <3 cm → no follow-up
  - 3–3.9 cm → US q3 yrs
  - 4–4.9 cm → annual imaging
  - 5–5.4 cm → q6 months
  - ≥5.5 cm (men) → refer for surgery
- Iliac aneurysm >3.5 cm → refer
- Growth >1 cm/year → refer

VISCERAL & VENOUS FINDINGS

- Splenic artery aneurysm:
  - ≥2 cm → refer (earlier if pregnancy risk)
- Hepatic/SMA aneurysm → refer at any size
- Renal artery aneurysm ≥1.5 cm → refer
- Venous thrombosis → treat clinically (not imaging follow-up)
- IVC dilation → consider cardiac disease (echo)

PCP FLOWCHART: INCIDENTAL VASCULAR FINDING

Incidental vascular finding

↓

Arterial vs Venous?

↓

Arterial → Size?

- Small → follow
- Large (threshold) → refer

↓

Venous → thrombosis?

- Yes → treat
- No → usually no follow-up

KEY TAKEAWAYS

Most incidental findings benign

Use guidelines consistently

Avoid unnecessary imaging

Right test, right patient

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THANK YOU

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