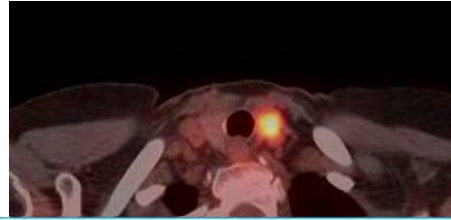
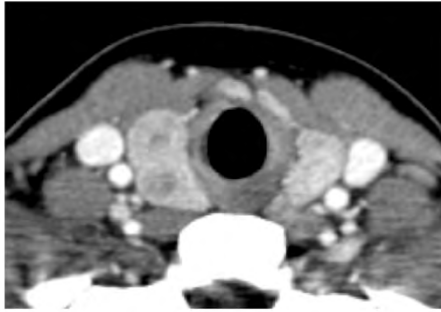
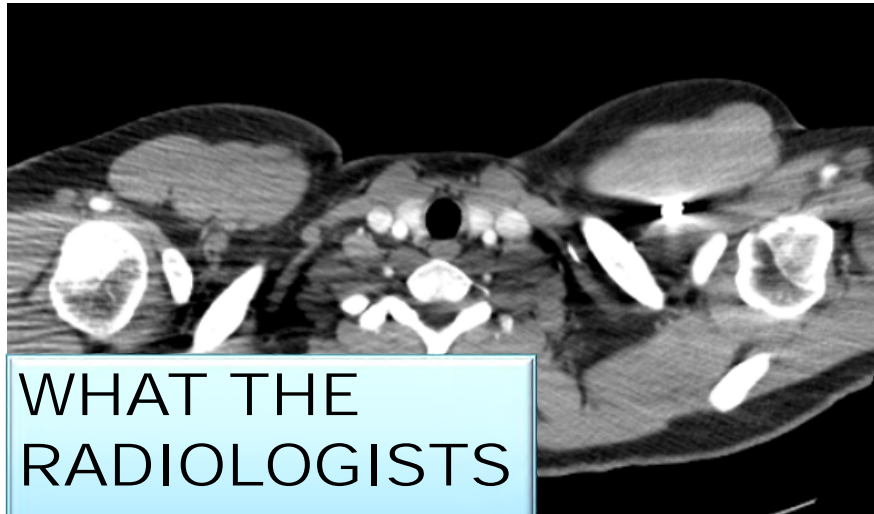


# THYROID INCIDENTALOMA



What the Radiologists read:  
What the Endocrinologist sees:



WHAT THE  
RADIOLOGISTS  
READ:

JOHN M. GALLAGHER DO

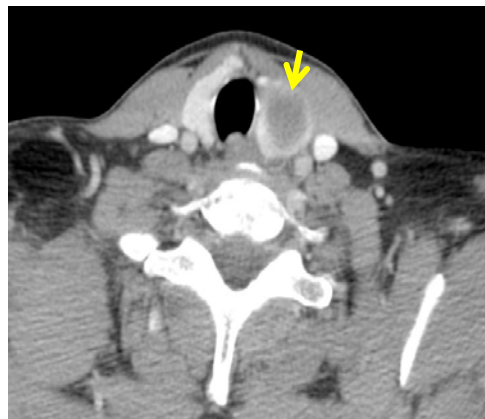
## OBJECTIVES

1. To appreciate the significance of incidentalomas in imaging.
2. To help the clinician interpret the findings and understand reasons for recommended follow up imaging.
3. To understand the issues facing Radiologists.
4. To provide information the clinician can use to discuss findings with their patients.

The patient is a 55 year old male with a conventional chest x-ray finding of "findings suspicious for a small right upper lobe pulmonary nodule, CT recommended for further evaluation." A contrast CT study of the chest is performed.

Report reads:

1. No evidence of pulmonary nodule
2. Incidentally noted is a 1.7cm nodule within the left lobe of the thyroid gland. Correlate clinically.



<http://radiopaedia.org/blog?page=10>

## DEFINITION: INCIDENTALOMA

- A Radiology term for a mass found incidentally on imaging studies performed for unrelated reasons.
- Common incidentalomas seen in practice include: Thyroid, lung, liver, Adrenal, Renal.
- Thyroid incidentalomas are the most common form of endocrine incidentalomas.
- Thyroid incidentaloma is described as a mass identified on an imaging study including the neck for reasons other than Thyroid disease.

## INCREASE IN DETECTION OF INCIDENTALOMAS

- Number of CT scans increasing.
- Rising from 3 million annually in 1980 to 80 million currently.
- Increase use of MRI and Ultrasound.
- Quality of CT, MRI and Ultrasound have significantly improved.

### INCIDENCE OF INCIDENTALOMAS

- 70% SCREENING COLONOGRAPHY.
- 34% BLUNT TRAUMA PATIENTS.
- 50% CHEST CT'S.
- 15% LIVER AND KIDNEY ON ABDOMINAL CT.

< 1% REPRESENT LETHAL CARCINOMAS

### THYROID INCIDENTALOMA

- CHEST CT = 25%
- CT/MRI neck = 16% - 18%.
- NECK/CAROTID SONOGRAM = 20%  
- 67%
- PET - 1% - 2% (abnormal uptake)
- AUTOPSY - 49.5% - 65%

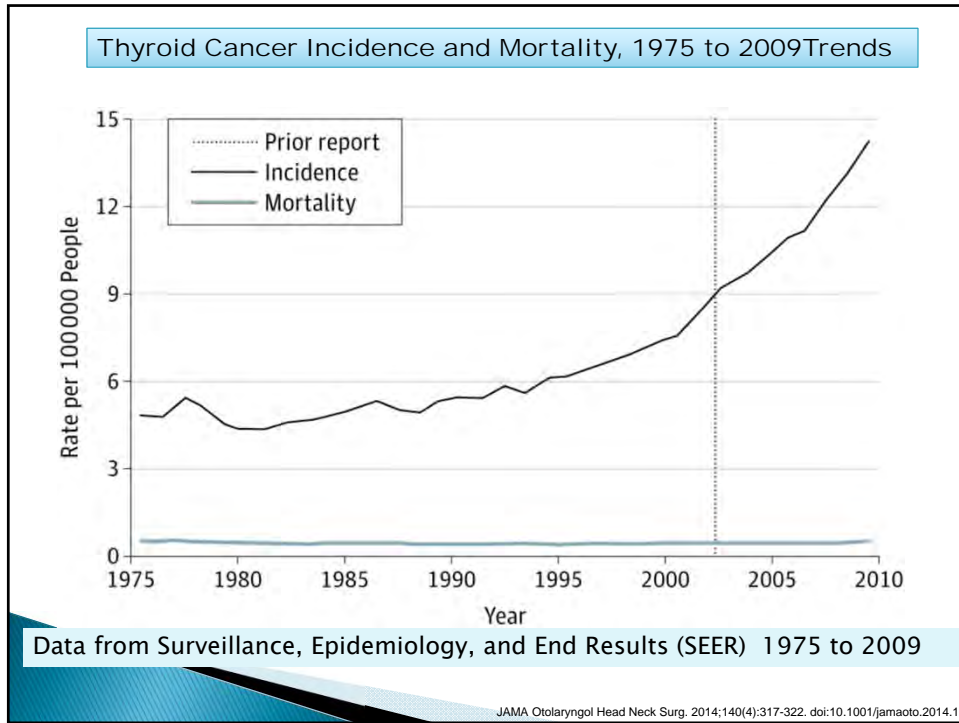
## THYROID NODULE FACTS

- Incidental thyroid nodules are common.
- Thyroid cancer is uncommon.
- 1.6% of patients with thyroid nodules will have thyroid cancers.
- Small thyroid cancers are relatively slow growing.
- Approx. 96% of thyroid cancers are papillary and follicular cancers which each have excellent prognosis.
- Observed incidence of thyroid cancer has increased - Mortality has remained stable.

## THYROID CARCINOMA FACTS

TYPE	%	Survival
Papillary	60 - 80 %	90 - 95 % 20 yr survival
Follicular	10 - 20 %	75 % 20 year survival
Medullary	5 %	42 % 10 year survival
Anaplastic	1 - 2 %	5 % 5 year survival

>96 % are papillary and follicular  
 Anaplastic results in 14 - 50% of cancer deaths



## OVERDIAGNOSIS

- Diagnosed with a condition that will not cause clinical symptoms and may not cause harm.
- This may explain why more thyroid cancers are being found however mortality is stable.
- Most cancers found are papillary carcinoma.

## ISSUES FACING PHYSICIANS

- Tasked with discussing incidentalomas with patients.
- Most incidentalomas are benign – however leads to further testing .
- Further testing can be costly and increases patients anxiety.
- Debate - Is finding incidentaloma good or bad?
- **GOOD:** Pathology found early is generally good for prognosis.
- **BAD:** Patient anxiety, cost and possibly unnecessary additional imaging and possible invasive testing.

## ISSUES FACING RADIOLOGISTS

- To determine if a Thyroid nodule is benign or malignant.
- To determine which nodule should undergo biopsy.
- To determine who will benefit from further investigation without unnecessary testing.

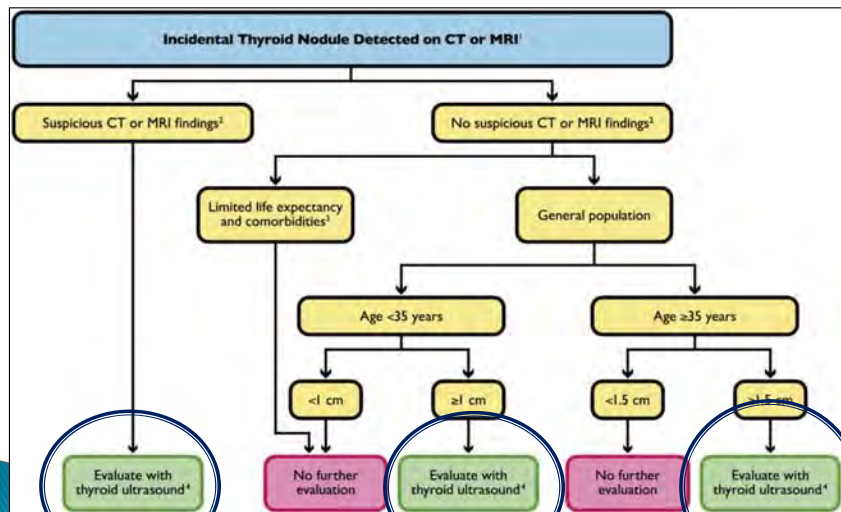
INCIDENTAL THYROID NODULES ON CT AND MRI

- On CT the thyroid is intrinsically dense.
- Nodules can be readily seen even without contrast.
- On MRI benign and malignant thyroid nodules can have similar signal characteristics.

There are no reliable signs on MRI or CT which can confidently characterize a nodule as benign or malignant.

White Paper of the ACR Incidental Thyroid Findings Committee

CT/MRI



Journal of the American College of Radiology 2015 12: 443-150DOI: (10.1016/j.jacr.2014.09.003)



Ultrasound is the image study of choice for initial follow up.

- Allows for measurement of size for node monitoring.
- Can identify multiple nodules.
- Can evaluate for lymphadenopathy.
- Allows characterization of internal architecture.
- Plays important part of who gets biopsied.

## Sonogram Characteristics

### Benign:

- Halo - fibrous pseudocapsule
- Cystic or predominately cystic

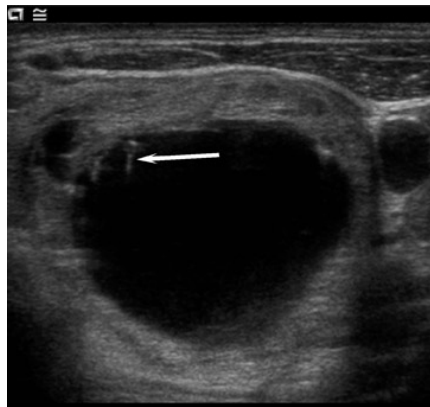
### Malignant:

- All solid - 15 - 27% chance of malignancy
- Micro calcifications or irregular calcifications in solid nodule
- Hypoechoic
- Suspicious lymph nodes

- Ultrasound however cannot reliably distinguish thyroid as being malignant or benign.
- There is overlapping of many of the characteristics.
- Hypoechoic nodule is suggestive of malignancy - however majority of nodules are benign.
- Halos favor benign nodule - however 10%-24% of papillary have incomplete halos.

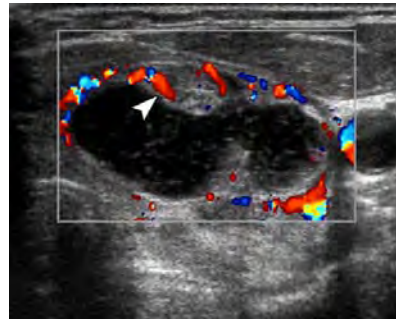
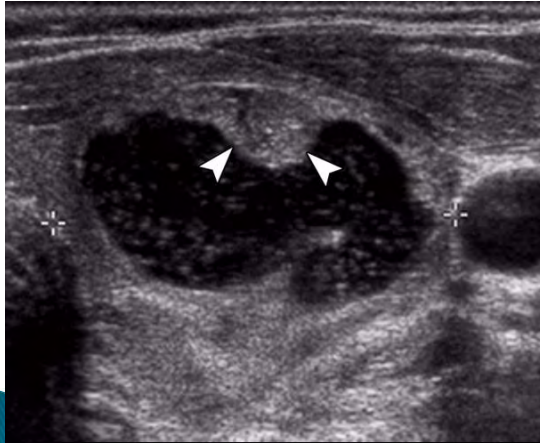
## Benign characteristic

Comet tail



<http://www.appliedradiology.com/articles/thyroid-nodules-when-to-biopsy>

## Combined solid and cystic lesion



13% - 26% of thyroid cancers show cystic components.

<http://pubs.rsna.org/doi/figure/10.1148/radiol.2373050220#>

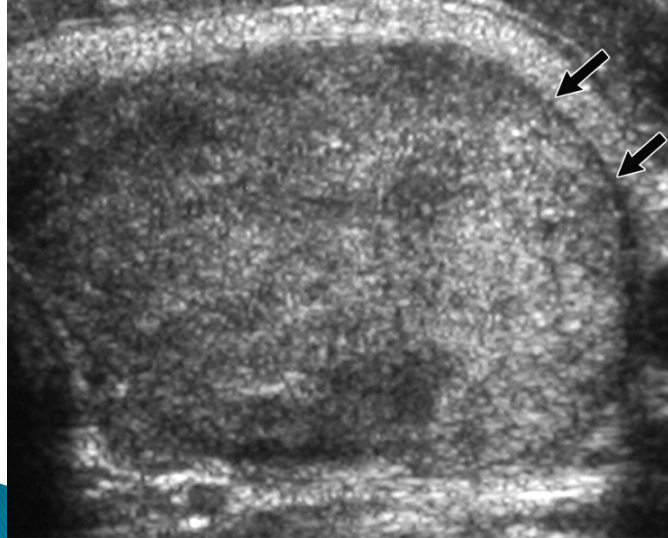
## Benign characteristic

HALO



<http://www.ultrasound-images.com/thyroid.htm# Malignant thyroid nodule>

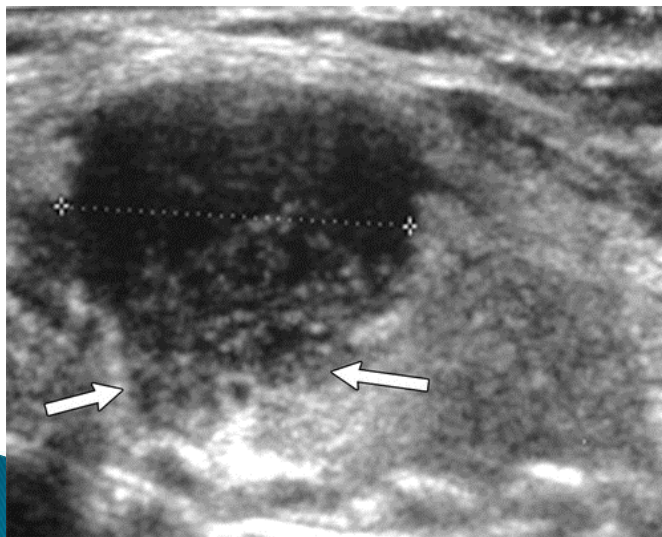
### Benign characteristic



Halo

<http://images.rsna.org/index.html?doi=10.1148/rg.273065038&fig=F9>

### Malignant characteristic



- Hypo-echoeochic
- Poorly defined
- No halo

<http://pubs.rsna.org/doi/full/10.1148/rg.273065038>

## PAPILLARY CARCINOMA.



- Hypoechoic
- Poor halo
- Margins poorly defined.

<http://radiographics.rsna.org/content/27/3/847.full.pdf+html>

## Malignant characteristic

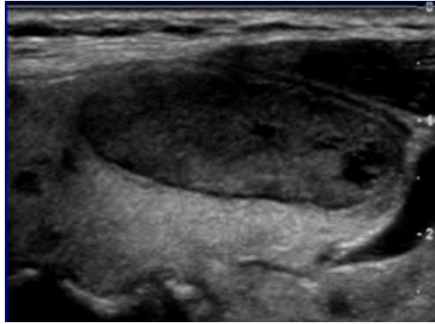
Micro calcifications



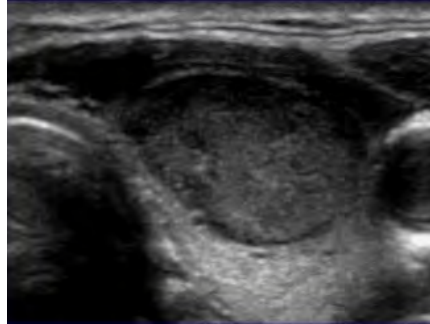
<http://www.ultrasound-images.com/thyroid.htm# Malignant thyroid nodule>

## OVERLAPPING FINDINGS

Benign hyperplastic nodule



Papillary ca



<http://www.slideshare.net/u.surgery/the-epidemic-of-thyroid-nodules-which-should-undergo-fine-needle-aspiration>

## Size

- Multiple studies have shown poor correlation between size of a nodule and risk of malignancy.
- Society of Radiologists in Ultrasound – attempted to balance uncertainty of small lesion detection resulting in improved outcome vs need to limit excessive biopsies.



Society of Radiologists in Ultrasound consensus statement

**TABLE 2**  
**Recommendations for Thyroid Nodules 1 cm or Larger in Maximum Diameter**

US Feature	Recommendation
Solitary nodule	
Microcalcifications	Strongly consider US-guided FNA if $\geq 1$ cm
Solid (or almost entirely solid) or coarse calcifications	Strongly consider US-guided FNA if $\geq 1.5$ cm
Mixed solid and cystic or almost entirely cystic with solid mural component	Consider US-guided FNA if $\geq 2$ cm
None of the above but substantial growth since prior US examination	Consider US-guided FNA
Almost entirely cystic and none of the above and no substantial growth (or no prior US)	US-guided FNA probably unnecessary
Multiple nodules	Consider US-guided FNA of one or more nodules, with selection prioritized on basis of criteria (in order listed) for solitary nodule*

Note.—FNA is likely unnecessary in diffusely enlarged gland with multiple nodules of similar US appearance without intervening parenchyma. Presence of abnormal lymph nodes overrides US features of thyroid nodule(s) and should prompt US-guided FNA or biopsy of lymph node and/or ipsilateral nodule.

\* Panel had two opinions regarding selection of nodules for FNA. The majority opinion is stated here.

[www.med-ed.virginia.edu/courses/rad/Thyroid\\_Ultrasound/04rec/rec-01-01.html](http://www.med-ed.virginia.edu/courses/rad/Thyroid_Ultrasound/04rec/rec-01-01.html)

## Fine needle aspiration

- Fine needle aspiration (FNA) carries minimal risk.
- Some non malignant nodules are difficult for cytology to confirm a benign diagnosis.
- This leads to repeat biopsy or surgery.
- Retrospective studies have shown:
  - 25 % - 41 % who undergo FNA proceed to surgery
  - Of those 36 - 75 % will be reported as benign

JACR February 2015 Volume 12, Issue 2, Pages 143-150

## Multiple nodules

### When to biopsy?

Society of Radiologists consensus:

Thyroid with multiple similar nodules with no intervening parenchyma- likely not necessary.

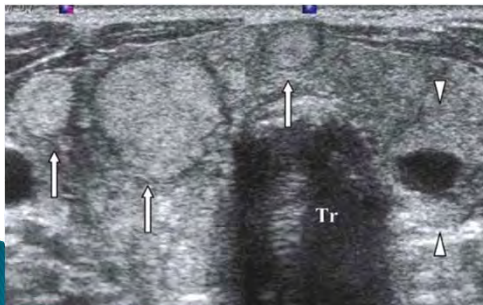
Discrete multiple nodules - 2 opinions

- 1) Primarily on ultrasound characteristics other than size - Majority
- 2) Largest should undergo biopsy - minority

HORMONES 2010, 9(4):287-298

## Multiple nodules

- Common belief- Multiple nodules decrease the likelihood of cancer.
- In multinodular gland the cancer rate per nodule is decreased however the overall rate of cancer is the same when compared to a solitary nodule.

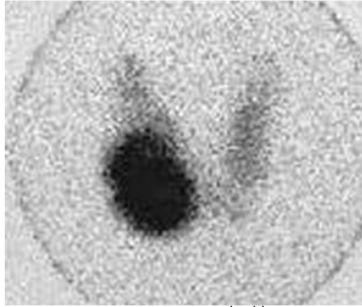


HORMONES 2010, 9(4) 287-298

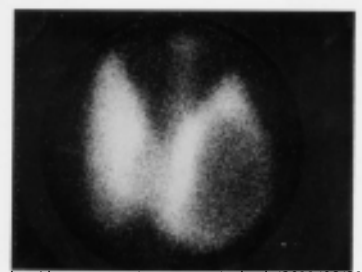
[www.slideshare.net/u.surgery/the-epidemic-of-thyroid-nodules-which-should-undergo-fine-needle-aspiration](http://www.slideshare.net/u.surgery/the-epidemic-of-thyroid-nodules-which-should-undergo-fine-needle-aspiration)



## Nuclear Thyroid exam



[www.healthtap.com](http://www.healthtap.com)



[www.thyroidmanager.org/wp-content/uploads/2011/06/31-3.gif](http://www.thyroidmanager.org/wp-content/uploads/2011/06/31-3.gif)

Largely abandoned in the initial workup of a thyroid nodule.

Can determine if a nodule is functioning:

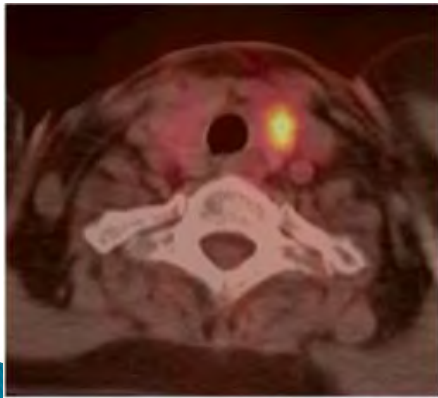
**Hot nodule:** 5% - (<1% are malignant)

**Cold nodule:** 80 - 85% - (about 10% are malignant)

Can be useful when abnormal thyroid lab values are present.

## PET SCAN

54 year old female with breast cancer who undergoes PET scanning for pre-surgical planning. The report indicates " a focus of FDG uptake is noted within left lobe of the thyroid with an SUV of 7.0."



[http://openi.nlm.nih.gov/detailedresult.php?img=2732624\\_1477-7819-7-63-1&req=4](http://openi.nlm.nih.gov/detailedresult.php?img=2732624_1477-7819-7-63-1&req=4)

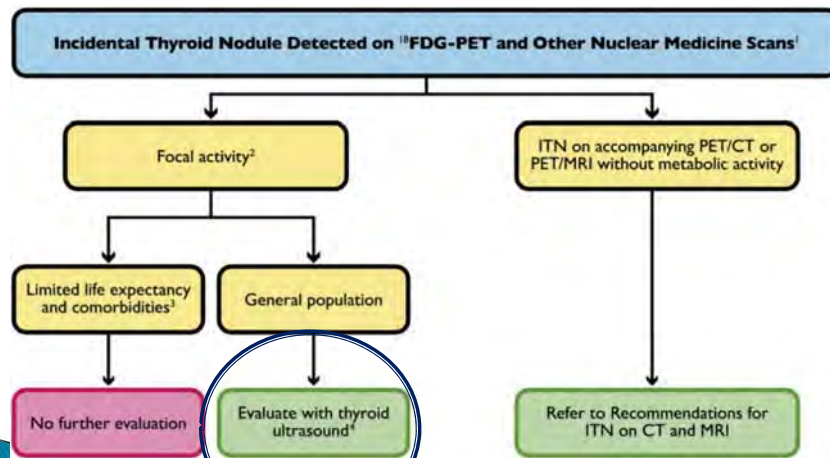
### Incidental finding of thyroid nodule on 18FDG PET scan.

- Thyroid incidentalomas on PET – approximately 2%-4%
- Increase activity on PET imaging is highly suspicious for malignancy and is independent of sonographic findings.
- Studies have shown a malignancy rate of 11% - 13% in nodules with increase uptake and normal sonographic findings.

AJR Am J Roentgenol. 2008; 191: 598-603  
Ultraschall Med. 2014; 35: 51-58


### White Paper of the ACR Incidental Thyroid Findings Committee

#### FDG- PET



Journal of the American College of Radiology 2015 12, 143-150DOI: (10.1016/j.jacr.2014.09.038)

- ACR committee on Incidental Thyroid nodules developed a White paper on radiographic reporting.
- Developed to standardize reporting practices and to limit unnecessary testing and to decrease overdiagnosis.
- Any nodule not meeting criteria should not be mentioned in the impression of the report.
- Reported reduction of FNA by 34% - 46%.
- Resulted in a 54% decrease in reports of incidental nodules in impression.

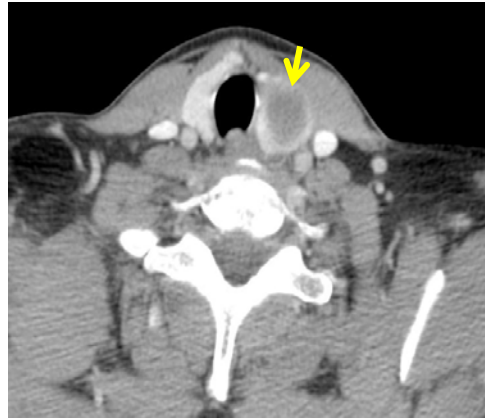
 <b>DUKE'S 3-TIERED SYSTEM</b>	
CT/MRI/PET-CT Features	Recommendation
<b>Category 1:</b> Thyroid nodule PET avid or Thyroid nodule locally invasive or Suspicious lymph nodes	Strongly consider workup with <b>US</b> for any size nodule
<b>Category 2:</b> Solitary thyroid nodule in patient <35 years age	Consider workup with <b>US</b> if ≥1 cm in adults. Consider workup with ultrasound for any size in pediatric patients.
<b>Category 3:</b> Solitary thyroid nodule in patient ≥35 years age	Consider workup with <b>ultrasound</b> if ≥1.5 cm
Multiple nodules	Consider <b>ultrasound</b> with recommendations prioritized on basis of criteria (in order listed) for solitary nodule

<http://radiopaedia.org/blog/reporting-of-incident-thyroid-nodules-on-ct-and-mri-1>

The patient is a 55 year old male with a conventional chest x-ray finding of "findings suspicious for a small right upper lobe pulmonary nodule, CT recommended for further evaluation." A contrast CT study of the chest is performed.

Report reads:

1. No evidence of pulmonary nodule
2. Incidentally noted is a 1.7cm nodule within the left lobe of the thyroid gland. Correlate clinically.



<http://radiopaedia.org/blog?page=10>

## TAKE HOME POINTS

- Thyroid nodules are common
- Majority >95% are benign
- About 50% of population have thyroid nodules.
- Majority of Thyroid cancers approx. 96% are Papillary or Follicular cancers.
- Papillary and follicular cancers have near 100% 5 year survival for stage 1 and stage 2.
- Observed thyroid nodules has increased rapidly in last several decades however mortality is stable.

## TAKE HOME POINTS

- Sonogram is the initial imaging method for evaluation of an incidentally discovered thyroid nodule.
- Sonogram cannot reliably distinguish between benign and malignant nodules.
- Combination of size and sonogram characteristics are used to determine which nodule to follow or which requires more aggressive workup.

THE END