IMPLEMENTING TI-RADS

Effect on thyroid ultrasound reporting and management practices in an academic hospital

EMILY HT PANG, MD, FRCPC
MOHAMMED BUKHARI, MBBS
ALISON C HARRIS, MBChB, FRCR, FRCPC
VANCOUVER GENERAL HOSPITAL
UNIVERSITY OF BRITISH COLUMBIA

BACKGROUND

Thyroid nodules are exceedingly common

• Incidence estimated at 20-78% of the adult population
• Vast majority are benign (90-95%) and malignant nodules frequently non-aggressive

Thyroid ultrasound and FNA constitute an increasing percentage of case volume

• Estimated 5-6% of cases per day at our institution, approximately 1600 cases in 2017 (up from 1200 in 2010)
• Large part due to increased incidental detection on CT/US

Several issues were identified with regards to thyroid ultrasound in our department

1. Quality of reporting of thyroid ultrasound is highly variable
   • Module features are used to stratify into benign versus suspicious patterns, however these features are not consistently described
   • Lack of consistency in providing management recommendations
     • Based on variations of either the 2009 (outdated) or 2015 ATA criteria
     • Often no specific management suggestions given

2. Overdiagnosis is a recognized problem – potential rate of benign biopsies
   • Unnecessary cost and patient risk
   • Wait-times could be in excess of 3 months

American College of Radiology
Thyroid Imaging Reporting and Data System (TI-RADS)

White paper published in 2017 (previous lexicon published 2015)

Provides user friendly guidelines for stratifying thyroid nodules into low to high risk groups based on assigning points according to nodule imaging features. Also provides management guidelines.

The introduction of the ACR Thyroid Imaging Reporting and Data System (TI-RADS) in 2017 provided an opportunity to overhaul the way we report thyroid ultrasound and address these issues.
AIMS

01 To increase the frequency of thorough descriptions of thyroid nodule features in reports

02 To improve consistent inclusion of management recommendations.

03 To reduce the number of benign FNA biopsies and improve diagnostic accuracy

PRE TI-RADS

Feb - Mar 2017
200 consecutively assessed thyroid nodules (140 patients) evaluated with ultrasound +/- FNA

POST TI-RADS

Feb - Mar 2018
200 consecutively assessed thyroid nodules (126 patients) evaluated with ultrasound +/- FNA

There were also a number of secondary questions which were evaluated:

1. What is the adoption rate of TI-RADS score reporting?
2. Does TI-RADS change the frequency with which we are recommending specific management?
3. Would wait-times and costs to the healthcare system be reduced?

POPOPULATIONS ASSESSED

Maximum of 2 highest suspicion nodules recorded per patient in both groups. Exclusions: high risk patients, known thyroid cancer, previously biopsied nodules with known pathology

METHODS

Multipronged approach to implementation to ensure all stakeholders engaged

- Endocrinology/ENT
- Clerical Staff
- Ultrasound Technologists
- Radiologists/Trainees

Rounds given to staff and fellows, resident teaching
Liase with other radiology groups in the region to standardize implementation

“Cheat sheet” created as easily accessible reading room resource

[Dec 2017] TI-RADS Reporting Go-Live

[Jan 2018] Initiate wait-time solutions

IMPLEMENTATION TIMELINE
**01 RESULTS**

Compare the percentage of reports which include descriptions of relevant thyroid nodule ultrasound features in the pre-TIRADS and post-TIRADS groups

**Pre-TIRADS**
- Defining features such as composition (68%), echogenicity (40%), and calcifications (42%) were not consistently reported
- Vascularity also relatively frequently reported but no longer felt to be a discriminating feature

**Post-TIRADS**
- 91% of reports assigned a TIRADS score to nodules
- Most consistently reported feature – echogenicity - mentioned in 93% of reports, others range from 88-93%
- Features more consistently reported when template used

**Bottom line:** Significantly more thorough nodule descriptions on reports post TI-RADS, and wide dissemination of TIRADS usage in general.

Notes: Features assessed: Composition (COMP), echogenicity (ECHO), shape (SHAP), margins (MARG), echogenic foci/calcifications (E.FOCI). Vascularity not assessed as not included in 2015 ATA or TI-RADS guidelines.

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**02 RESULTS**

Compare the percentage of reports which include management recommendations and frequency of specific recommendations in the pre-TIRADS and post-TIRADS groups

**Per centage of specific management recommendations in reports**

**Pre-TIRADS**
- FNA 55%
- Follow-up ultrasound (F/U) 8%
- No FNA or follow-up required (NONE) 23%
- No F/U 14%

**Post-TIRADS**
- FNA 42%
- Follow-up ultrasound (F/U) 28%
- No FNA or follow-up required (NONE) 4%
- No F/U 26%

**Some sort of recommendation now made in the vast majority of reports**
- 96% (post) versus 78% (pre)
- Gives clinicians some guidance as to how to proceed

**Reduction in recommended FNAs**
- From 55% (pre) to 42% (post)
- Biopsies requested but not performed in 8 (pre) and 17 (post) cases due to subthreshold nodules

**Now recommending more follow-up ultrasounds but also more nodules not requiring any follow-up**
- Follow up: 8% (pre) vs 28% (post)
- No follow-up: 14% (pre) vs 26% (post)
Does usage of TI-RADS decrease the number of unnecessary biopsies and improve accuracy?

Two ways of looking at this:

1. Of the thyroid nodules in the pre and post TIRADS group that were biopsied (71 and 60 respectively), what was the rate of positive biopsies?

Pre-TIRADS, 4% of satisfactory FNAs yielded a positive or indeterminate result for malignancy, increasing to 12% post TIRADS.

2. Evaluate 198 consecutively FNA’ed thyroid nodules from the pre TI-RADS period that have pathology available and re-score these nodules using TI-RADS. How many would

Findings suggest that positive biopsy rate and diagnostic accuracy improves after TI-RADS implementation. 

- 4 indeterminate nodules missed - 3 of which would be followed up; 1 cancer would not have been biopsied but would have been followed up (TR4 but did not meet size criteria)
- Positive rate (including indeterminate lesions) in this population theoretically improves from 18.6 to 24.4%, diagnostic accuracy from 15.7 to 35.4% (sensitivity 97.2%, specificity 21.6%).
**ADDITIONAL RESULTS**

**ESTIMATED COSTS TO HEALTHCARE SYSTEM**

Estimated costs of the management recommendations for the 200 nodules in each of the pre and post TIRADS groups:

- **Pre-TIRADS**: $17929.71 CAD
- **Post-TIRADS**: $16576.04 CAD

**TI-RADS implementation resulted in modest cost savings**

Assumptions:
- *Based on the British Columbia Medical Services Plan Fee Guide
- *Approximately 50% of nodules for which no specific follow-up recommendation was given in the pre-TIRADS group underwent follow-up ultrasounds anyway, the estimated costs of these follow-up ultrasounds was included.
- *Pre TIRADS costs likely underestimated – pathologists salaried thus difficult to estimate cytopathology costs and were not included

**WAIT TIMES**

Thyroid FNA wait-times not significantly changed: 73 days (pre-TIRADS) versus 70 days (post-TIRADS).

In part because it is too early to tell during the period assessed as backlog was still being cleared. Anecdotally however, current wait-times have not significantly decreased - in large part due to increased demand.

**LIMITATIONS**

- Limited sample size and relatively low incidence of thyroid malignancy
- Several factors not taken into account which could affect management recommendations (i.e. previous follow-up duration, patient and MD preference)
- Image review based on still images, variability among ultrasound vendors (esp. with microcalc)

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**CONCLUSIONS**

**TIRADS implementation improved report quality by encouraging more descriptive reports.**

More reports included management recommendations. Additionally, fewer FNAs and more follow-up ultrasounds are being recommended with modest cost reduction.

TIRADS shows promise in reducing unnecessary FNAs while improving diagnostic accuracy, thus contributing to decreasing overdiagnosis.

More work still needs to be done, including ongoing auditing and particularly with regards to wait times.

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**REFERENCES**

- Haugen BR, Alexander EJ, Bible KC et al. 2015 American Thyroid Association Management Guidelines for Adult Patients with Thyroid Nodules and Differentiated Thyroid Cancer: The American Thyroid Association Guidelines Task Force on Thyroid Nodules and Differentiated Thyroid Cancer. Thyroid. 2016 26(1):1-139.