

# Show Me The Money!

## Institutional Experience with Molecular Testing of Thyroid Nodules

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### BACKGROUND

- Cytology from thyroid nodule biopsy often shows atypia of undetermined significance (AUS) leading to surgery for ultimately benign histology
- Molecular testing, such as ThyGenX/ThyraMIR, can augment clinical decision making in thyroid nodule management
- ThyGenX/ThyraMIR testing identifies mutations and provides variable risk of malignancy based on genotype and miRNA expression profile
- ThyGenX assesses common genetic alterations across 8 genes associated with papillary and follicular carcinoma
- ThyraMIR is an miRNA gene expression classifier based on evaluation of expression of 10 short, non-coding miRNAs that regulate translation
- This project examined ThyGenX/ThyraMIR testing of thyroid nodules in the San Antonio Military Health System (SAMHS)

### METHODS

- Retrospective review of SAMHS patients who underwent ThyGenX/ThyraMIR testing for indeterminate thyroid nodules over an 18 month time period
- Current clinical practice is to dedicate one fine needle aspirate pass in ThyGenX/ThyraMIR collection media at time of repeat biopsy after initial atypia of undetermined significance cytology result
- Thyroid nodule genetic testing was completed for fine needle aspirate biopsy cytology showing atypia of undetermined significance for 2 or more biopsies
- Non-industry cost analysis performed comparing multiple medical procedures and therapies in the SAMHS

### RESULTS

- 24 patients had ThyGenX/ThyraMIR testing in the 18 month time frame
- All patients had indeterminate cytology on two FNA biopsies
- Molecular testing identified mutations in 5 patients; 4 underwent thyroidectomy
  - 3 patients with papillary thyroid cancer and 1 with benign histology
- 2 patients with negative molecular testing underwent hemithyroidectomy with benign post operative histology
- ThyGenX/ThyraMIR testing costs \$2,600 per sample in the SAMHS
- Total ThyGenX/ThyraMIR testing cost \$62,400 for 24 SAMHS patients
- Benign molecular testing could prevent 19 patients from undergoing unnecessary surgery, saving the SAMHS approximately \$466,000

### SAMHS Thyroid Nodule Genetic Mutations

Age	Gender	Nodule Location	1 <sup>st</sup> Cytology	2 <sup>nd</sup> Cytology	Mutation	Post-Operative Diagnosis
60	Female	L midpole	AUS	AUS	BRAF (V600E)	Multifocal Papillary Thyroid Carcinoma, Follicular Variant, Infiltrative
29	Female	R midpole	AUS	AUS	KRAS (Q61K)	Multifocal Papillary Thyroid Carcinoma, Classic and Follicular Variants
38	Female	L midpole	Suspicious for Follicular Neoplasm	Suspicious for Follicular Neoplasm	NRAS (Q61R)	Patient declined surgery
51	Female	L midpole	AUS	AUS	HRAS (Q61R)	Benign; Dominant Adenomatoid Nodule
43	Female	L inferior R midpole	L : AUS R : AUS	L : Suspicious for Follicular Neoplasm R : AUS	L : HRAS (Q61R) R : NRAS (Q61R)	Left and Right: Multifocal Papillary Thyroid Carcinoma

### SAMHS Medical Cost Analysis

Medical Procedure or Therapy	Approximate Cost
Thyroid Ultrasound for FNA	\$119.00
Initial Fine Needle Aspirate (FNA) and Cytology Assessment	\$148.00
Repeat Fine Needle Aspirate (FNA) and Cytology Assessment	\$148.00
Partial Thyroidectomy	\$12,740.00
Total Thyroidectomy	\$12,740.00
Two Follow Up Appointments with Surgeon	\$242.00
Twice a Year Appointment with Primary Care Physician	\$265.00
Annual TSH Testing	\$24.00
Lifetime Levothyroxine Therapy (Average Age of Incidence = 40; Life Expectancy = 78)	\$3,564.00
ThyGenX/ThyraMIR genetic testing	\$2,600.00 – DoD \$5,000.00 – Non-DoD

### CONCLUSIONS

- Molecular testing for patients with indeterminate thyroid nodule cytology is a cost-effective tool in the SAMHS
- No patient with negative genetic testing had evidence of malignancy
- This may help patients avoid unnecessary surgery and hypothyroidism
- The cost of molecular testing is significant but far less than the cost of thyroidectomy with its associated care
- Molecular testing to reduce unnecessary surgery represents a benefit to patients and a cost-savings to the SAMHS

### REFERENCES

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