The Effective Use of Telehealth in the Evaluation and Management of Thyroid Nodules

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Objectives

- Describe Telehealth
- Discuss Challenges and Opportunities of thyroid nodules assessment via telehealth
- Discuss how telehealth can enhance value based care

Thank you, Dr. Tuttle!

- NCCN
- ATA
- AES
- Chernobyl Tissue Bank
- Endocrinologic and Metabolic Drugs Advisory Committee of the FDA

Tele-definitions

- Telemedicine is the clinical use of remote technology to perform clinical medicine
- Telehealth is the broader idea which connotes remote access and incorporates both clinical and non-clinical surveillance, diagnosis and treatment as well as medical knowledge sharing and education both synchronous and asynchronous
- Telemonitoring is ongoing monitoring by a device such as heart rate or rhythm
- Telephone is a vestige of the 20th Century

Why Telehealth?

- Value Based Care
- Do the right assessment on the right patient at the right time
- Do the right operation on the right patient at the right time
- Bring expertise to the patient
- Bring the patient to expertise

Value Based Care

- Value=Quality/Cost
- Q= low complication rates, convenient service, maximizing the risk to benefit ratio
- C=cost to the health care system, cost to the provider but mostly cost to the patient and their family in terms of travel, hotel, food, missed work, etc.
Nebraska - A State Built for Telehealth

- 77,354 square miles
- 1.9 million people
- 43rd in population density
- 89% of cities are under 3000
- 2/3 of Nebraskans live outside Omaha and Lincoln

Challenges of Telehealth

- Compatibility of HMR
- Bandwidth (IT and metaphorical)
- Coordination of schedules
- Billing and insurance
- State law

Over Diagnosis and Biopsy of Nodules

- Prevalence
- Technology
- Experience
- Rorschach
- Fear

Prevalence

- Depends on age, sex, family history, radiation exposure, geography and detection method!
- Palpable nodules exist in 6.4% of women and 1.5% of men
- Ultrasound rates 49% in study in random Beijing adults
  - Increases with age and BMI
  - Similar to autopsy studies
- Malignancy rates are 5-6% of all nodules higher in men than women and in ages < 30 and > 60 years and nodules larger than 2 cm

Technology

- Carotid ultrasound for TIA-19.6%1
- CT chest for other reasons-25%2
- PET scan for malignancy-8.4%3
  - 34% of nodules with focal uptake harbored malignancy (about half had workup)

3. Bae et al. Thyroid lesions detected by FOG PET/CT: prevalence and risk of thyroid cancer.
Toast face

Search for Meaning in Images

- Our visual brain tries to make order of chaos
- Hashimoto’s is easy to see “nodules” in single framed images
- Nodules represent a sense of order
- Questionable nodules = questionable biopsies
- Questionable biopsies = indeterminate biopsy results
- Indeterminant results = avoidable surgery

What does Success Look Like?

- Success is incremental (If we make a difference in one individual patient it is a success)
- Lower rate of biopsy of nodules
- Lower rate of surgery
- Predictable and low LOS
- Low readmission rates
- Low complication rate
- High patient satisfaction rate
- Reduced cost

Pre work

- Discuss with providers about the need and desire for service
- Site visit to meet with providers and ultrasound tech
- Review with tech the needed aspects of the ultrasound
- Determine whether real time or pushed scan is practical
- Determine scheduling needs

Process

- Clinic time 4 days a week and scheduled by the patient through local provider and head and neck clinic
- Meet patient and discuss plan
- Ultrasound done at facility by tech during appointment
- Nodules assessed for biopsy versus observation and discussed with patient
- If biopsy, FNA done either at home site (favored) or referred
- Results reported by phone
- If surgery recommended date is set and face to face visit offered day prior to surgery versus morning of surgery
TI-RADS risk of malignancy

- TIRADS-1 ≤2%
- TIRADS-2 ≤2%
- TIRADS-3 ≤5%
- TIRADS-4 5-20%
- TIRADS-5 >20%

Molecular Assessment for Diagnosis

- Diagnosis or Prognosis
- Diagnosis high negative predictive value
  - FLUS, Atypia, Follicular Neoplasm
  - Genomic mRNA classifier (Afirma) 96% NPV
  - Mutational analysis (ThyroSeq) 97-98 NPV
  - miRNA gene expression combined with mutational analysis (ThyraMIR and ThyGenX) 91-97% NPV

Fine Needle Aspiration (FNA)

- Benign on biopsy
  - Follow infrequently for growth and change in ultrasound characteristics
- Indeterminate
  - Genetic assessment versus surgery versus follow up
- Non diagnostic
  - Repeat FNA versus core versus follow up versus surgery
- Malignant
  - Surgery versus active surveillance
Reducing the number of FNAs

- Comparison of 5 ultrasound grading systems: ATA, ACR-TIRADS, AACE/ACE/AME, EU-TIRADS and K-TIRADS
- ACR-TIRADS resulted in fewest biopsies among 502 nodules in 477 patients
- 7.2% malignant
- 53.3% reduction in biopsies rate
- 2.2% false negative rate (missed malignancy)
- BUT nodules < 1cm (71), non-diagnostic and indeterminant (251) biopsies were excluded

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If Thyroidectomy is needed

- 150,000 Thyroidectomies per year
- 81% of thyroid operation are done by low volume surgeons
- 51% of thyroid operations are done by surgeons that do 1 per year
- Complication rates are 87% higher for these cases
- High volume surgeons cost $6,663 versus 10,396 for low volume

Complications by Surgeon Volume

<table>
<thead>
<tr>
<th>Complication</th>
<th>Low Volume</th>
<th>High Volume</th>
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<tbody>
<tr>
<td>All</td>
<td>15.8</td>
<td>7.7</td>
</tr>
<tr>
<td>Hypocalcemia</td>
<td>6.9</td>
<td>4.1</td>
</tr>
<tr>
<td>Bleeding</td>
<td>2.4</td>
<td>1.0</td>
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<tr>
<td>Vocal Cord Paralysis</td>
<td>1.2</td>
<td>0.7</td>
</tr>
<tr>
<td>Infection</td>
<td>1.1</td>
<td>0.1</td>
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Cost of Thyroidectomy by Volume

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<tbody>
<tr>
<td>Cost Increase (1000's)</td>
<td>0</td>
<td>2000</td>
<td>4000</td>
<td>6000</td>
<td>8000</td>
<td>10000</td>
<td>12000</td>
<td>14000</td>
<td>16000</td>
<td>18000</td>
<td>20000</td>
<td>22000</td>
<td>24000</td>
<td>26000</td>
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National benchmarks Thyroid Surgery

<table>
<thead>
<tr>
<th>Procedure</th>
<th>National Benchmark</th>
<th>Methodist Head and Neck</th>
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<tbody>
<tr>
<td>Thyroid lobectomy</td>
<td>91.3 min +/- 41.8</td>
<td>72.38 min 66 operations (54)</td>
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<tr>
<td>Total Thyroidectomy</td>
<td>125.3 min +/- 56.3</td>
<td>119.83 min 149 operations (87)</td>
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<tr>
<td>Thyroid LOS</td>
<td>1.1 days +/- 1.4</td>
<td>0.55 days</td>
</tr>
<tr>
<td>Return to OR 30d</td>
<td>2.36%</td>
<td>0.47%</td>
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<tr>
<td>30 day mortality</td>
<td>0.08%</td>
<td>0%</td>
</tr>
<tr>
<td>RLN injury</td>
<td>6%</td>
<td>0%</td>
</tr>
<tr>
<td>Hypoparathyroidism</td>
<td>6%</td>
<td>?</td>
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No FNA

- Monitor for change in size (2mm per year growth) or change in ultrasound characteristics or patient preference

Decision Making Analysis

- Risk/Benefit
  - Risk of cancer progression
  - Cost of repeat ultrasounds and visits
  - Psychological cost
  - Uncertainty of biopsy results
  - Multiple nodules
  - Anaplastic transformation
  - How we parse risk (individual psychology of risk assessment)
  - What are the long term outcomes and risks of both strategies
  - Medicolegal risk

Risk versus Benefit

- To the patient
- To the provider
- To the local community

Patient risks and benefits

- Risks
  - Missed diagnosis of cancer with interval change and worsened prognosis or disability
  - Lack of physical touch and actual human contact
  - Unnecessary diagnosis of nodules with potential for surgery with attendant morbidities
- Benefits
  - Convenience of having care at home
  - Mileage saved
  - Potentially fewer nodules

Provider risks and benefits

- Risks
  - Medicolegal risks due to missed diagnosis and reduced personal connection with patient
  - Potential for less enjoyment of practice using remote access
  - Psychological grief from missed diagnosis
- Benefits
  - Extends reach of expertise
  - Allows one to work directly with referring providers

Local Community risk and benefits

- Risk
  - Potentially seen as competition to community providers
- Benefits
  - Allows for access to specialty opinion on ongoing basis
  - Keeps the patient in the community
An emotional assessment:
If one has a favorable or unfavorable impression of the benefit of a given therapy, one will unconsciously assign fewer risks, and vice versa.

Paul Slovic states “experts measure in years of life saved”
“Public in good versus bad deaths and other finer more nuanced questions”

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Kahneman page 140 Thinking, Fast and Slow

Public will accept risk that is significantly greater if it is voluntary than if it is involuntary
Therefore: the patient must be the decider

5% chance of cancer
95% chance it is benign
If cancer, 90% behave non-aggressively so
1 in 200 people with a nodule will have a cancer that will behave aggressively

Medical Legal Risk
Westlaw Database
Comparison of lawsuits between 1987-2000 and 2000-2014
2.14 cases per year versus 2.27
Alleged missed diagnosis of cancer 20% versus 44%
Unclear if this was failure to biopsy, failure to ultrasound or failure of biopsy or other cause

Mitigation of Risk
Balancing the frequency of ultrasound on a gradual increasing basis
Inform the patient about low risk cancers that may be found at a latter date without increased risk to survival
Discuss the rare potential for transformation and the signs and symptoms to be aware and report to physician
Dysphagia
Voice change
Neck mass
Share evaluation as a team at tumor board when appropriate
### Telehealth Discussion

- Written and on-line information sheets
- Face to face meetings with US techs and providers
- Meeting prior to operation either day prior or morning of

### High Value Goals for Thyroid Nodule

- Same day comprehensive evaluation near patients home
- Reduced number of biopsies per nodule assessed
- Lower rate of surgery per nodule
- Low rate of vocal cord paralysis, hematoma, permanent hypoparathyroidism, infection rates
- Predictable cost per case

Thank you