**Definition:** Well-differentiated thyroid cancer includes both papillary and follicular thyroid carcinomas.

**Epidemiology:** The SEER Cancer Statistics reported an incidence of 3.2 per 100,000 for 15-19 year olds, increasing from previous years.\(^{(1)}\) Papillary thyroid carcinoma is the most common malignancy of the thyroid gland in children.\(^{(2)}\) Follicular thyroid cancer is uncommon, with medullary thyroid cancer, poorly differentiated tumors, and frankly undifferentiated (anaplastic) thyroid carcinomas are rare in young patients.\(^{(3)}\)

**Inclusion Criteria**
- Birth-25 years of age;
- Fine needle aspiration (FNA) biopsy proven well-differentiated thyroid carcinoma (papillary or follicular);
- No clinical or ultrasound evidence of loco-regional metastatic disease

**Exclusion Criteria**
- >25 year of age, well differentiated thyroid carcinoma with known loco-regional metastatic disease;
- Medullary or anaplastic thyroid carcinoma;
- Pregnancy

**Diagnostic Evaluation**

**History:** Assess for
- Prior radiation exposure
- Genetic syndromes

**Physical Examination**
- Visual examination and palpation of the thyroid

**Laboratory Tests**
- Thyroid function screen (T4 and TSH)
- Thyroglobulin panel
- Thyroid antibodies

**Diagnostic Imaging**
- Ultrasonography of the thyroid with fine needle aspiration

**Surgical Planning**

**Referral**
- Thyroid Tumor Board
- Pediatric surgery or Otolaryngology

**Laboratory Tests**
- Calcium
- Phosphorous
- Magnesium
- PTH
- Albumin
- Vitamin D 25 Hydroxy

**Diagnostic Imaging**
- Lymph node mapping if concern for regional disease

**Critical Points of Evidence**

**Evidence Supports**
- To complete initial lymph node mapping with ultrasound pre-operatively to evaluate for regional disease.\(^{(4-16)}\) – Strong recommendation, low quality evidence
- To evaluate the patient for pre-existing vitamin D deficiency prior to surgery and treat any deficiencies.\(^{(17-24)}\) – Strong recommendation, very low quality evidence
- To check postoperative parathyroid hormone and calcium levels to evaluate for hypoparathyroidism and hypocalcemia.\(^{(25-27)}\) – Strong recommendation, low quality evidence
- To administer post-operative oral calcium supplementation to patients post-thyroidectomy to avoid transient hypocalcemia.\(^{(28-30)}\) – Strong recommendation, moderate quality evidence

**Evidence Against**
- The routine use of computed tomography to evaluate for regional disease for pre-thyroidectomy evaluation.\(^{(4-16)}\) – Strong recommendation, low quality evidence
- Prophylactic central neck dissection in patients with papillary thyroid carcinoma and no loco-regional metastases.\(^{(31-39)}\) – Strong recommendation, moderate quality evidence
- The use of pre-operative calcium supplementation.\(^{(30,40)}\) – Strong recommendation, very low quality evidence

**Evidence Lacking/Inconclusive**
- The use of intermittent recurrent nerve monitoring during surgery to reduce incidence of nerve injury.\(^{(41)}\) – Unable to make a recommendation

*NOTE: The references cited represent the entire body of evidence reviewed to make each recommendation.*
Condition-Specific Elements of Clinical Management

**Admission Criteria**
- Admit for post-thyroidectomy care

**Discharge Criteria**
Patient can go home on calcium carbonate BID and calcitrol daily on postop if the patient has no hypocalcemia symptoms, no calcium level <8.5 during hospitalization, and an intra-op PTH >30.

**Consults/Referrals**
Endocrinology to follow and order weekly labs to wean calcium and calcitriol supplementation and manage thyroid hormone replacement therapy.

**Follow-Up Care**
- Thyroid replacement: Liothyronine
  - Age <10 years: 25 mcg daily
  - Age ≥10 years: 50 mcg daily

**Parent/Caregiver Teaching**
- Signs and symptoms of hypocalcemia: perioral and acral paresthesias, stiffness, clumsiness, myalgias, muscle spasms, diaphoresis, seizures.

**Measures**

**Process**
- Central and lateral neck dissections
- Use of recurrent nerve monitoring
- Post-operative laryngoscopy
- Readmissions or emergency center visits
- Returns to OR

**Outcome**
- Post-op transient hypocalcemia during hospitalization
- Rates of IV calcium use during hospitalization
- Patients requiring calcium supplementation at 6 months and 1 year post-op
- Recurrent laryngeal nerve injury
Perioperative Management of Well-Differentiated Thyroid Carcinoma Algorithm

**Begin**

- **Suspected Thyroid Carcinoma?**
  - Yes: Manage as appropriate to clinical findings (OFF Algorithm)
  - No: Initial Assessment

**Initial Assessment**

- Labs: TFT, Tg Panel, Thyroid Antibodies
- Imaging: US + Fine Needle Aspiration (FNA)
- Referral: Endocrinology

**FNA confirmed well-differentiated thyroid carcinoma**

- **Exclusion Criteria**
  - >25 year of age
  - Well-differentiated thyroid carcinoma with known loco-regional metastatic disease
  - Medullary or anaplastic thyroid carcinoma
  - Pregnancy.

**Yes**

- Pre-op Assessment & Surgical Planning
  - Labs: 25-OH vitamin D levels, Ca, Ph, Mg, PTH, albumin
  - Medications: If vitamin D <30 ng/mL, start 2,000 IU daily, if vit D <20, start 4,000 IU daily or 50,000 IU weekly.
  - Imaging: Lymph node mapping with or without lymph node biopsy
  - Pre-Op Visit: Pedi Surgery or Otolaryngology
  - Referral: Oncology

- **Day of Surgery**
  - Total Thyroidectomy without central neck dissection
  - Central neck metastases identified during surgery?
    - Yes: Consider central neck dissection (OFF Algorithm)
    - No: Post-operative Calcium Dosing

**Post-operative Calcium Dosing**

- **Calcium <7 mg/dL**
  - Re-check iCa, Ca, Mg, Phoe, PTH STAT by venipuncture.
  - If Symptomatic: Provider at bedside. Start IV calcium GLUconate 100 mg/kg dose (MAX 3,000 mg per dose), administer in large vein over 5-10 minutes
  - If Asymptomatic: Increase oral calcium CARbonate by 100% and increase calcitriol to BID with dose of each given NOW, consider IV

- **Calcium 7-8 mg/dL**
  - Re-check iCa, Ca, Mg, Phoe, PTH by venipuncture and notify provider on call for surgery. If unable to contact, escalate to Endocrine fellow on call.
  - Increase oral calcium dose by 30% and calcitriol to twice daily

- **Calcium >10.7 mg/dL**
  - Decrease oral calcium CARbonate dose by 50%

**Post-operative Calcium CARbonate Dosing**

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<th>Weight</th>
<th>Calcium CARbonate Dose</th>
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<tbody>
<tr>
<td>10-20 kg</td>
<td>250 mg</td>
</tr>
<tr>
<td>21-40 kg</td>
<td>750 mg</td>
</tr>
<tr>
<td>&gt;60 kg</td>
<td>1,500 mg</td>
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</table>

Available Preparations: Suspension 250 mg/mL, Tablet 500 mg

**Signs and Symptoms of Hypocalcemia**

- Tingling in hands or feet
- Muscle cramps
- Trousseau’s sign
- Chvostek’s signs
- Laryngospasm
- Tetany
- Seizures

**Neck lymphadenopathy on exam?**

- Manage as appropriate to clinical findings (OFF Algorithm)

- **Yes**
  - Assess patient and evaluate symptoms

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References


Clinical Standards Preparation
This clinical standard was prepared by the Evidence-Based Outcomes Center (EBOC) team in collaboration with content experts at Texas Children’s Hospital. Development of this clinical standard supports the TCH Quality and Patient Safety Program initiative to promote clinical standards and outcomes that build a culture of quality and safety within the organization.

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No relevant financial or intellectual conflicts to report.

Development Process
This clinical standard was developed using the process outlined in the EBOC Manual. The literature appraisal documents the following steps:

1. Review Preparation
   - PICO questions established
   - Evidence search confirmed with content experts

2. Review of Existing External Guidelines
   - NCCN Guidelines: Thyroid Carcinoma by the National Comprehensive Cancer Network (2016)
   - Management Guidelines for Children with Thyroid Nodules and Differentiated Thyroid Cancer by the American Thyroid Association Guidelines Task Force on Pediatric Thyroid Cancer (2015)
   - Guidelines for the Management of Thyroid Cancer by the British Thyroid Association (2014)
   - Thyroid Carcinoma by the American College of Radiology (2013)
   - Thyroid Cancer: EMSO Clinical Practice Guidelines for Diagnosis, Treatment, and Follow-Up by the European Society for Medical Oncology (2012).

3. Literature Review of Relevant Evidence
   - Searched: PubMed, Cochrane, AHRQ, National Institute for Clinical Excellence, Google Scholar

4. Critically Analyze the Evidence
   - Nine of meta-analyses, two randomized controlled trials, and twenty-seven nonrandomized studies.

5. Summarize the Evidence
   - Materials used in the development of the clinical standard, literature appraisal, and any order sets are maintained in a Perioperative Management of Well-Differentiated Thyroid Carcinoma evidence-based review manual within EBOC.

Evaluating the Quality of the Evidence
Published clinical guidelines were evaluated for this review using the AGREE II criteria. The summary of these guidelines are

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<th>Type of Evidence</th>
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<td>STRONG</td>
<td>Desirable effects clearly outweigh undesirable effects or vice versa</td>
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<tr>
<td>WEAK</td>
<td>Desirable effects closely balanced with undesirable effects</td>
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<tr>
<td>QUALITY</td>
<td>TYPE OF EVIDENCE</td>
</tr>
<tr>
<td>High</td>
<td>Consistent evidence from well-performed RCTs or exceptionally strong evidence from unbiased observational studies</td>
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<tr>
<td>Moderate</td>
<td>Evidence from RCTs with important limitations (e.g., inconsistent results, methodological flaws, indirect evidence, or imprecise results) or unusually strong evidence from unbiased observational studies</td>
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<tr>
<td>Low</td>
<td>Evidence for at least 1 critical outcome from observational studies, RCTs with serious flaws or indirect evidence</td>
</tr>
<tr>
<td>Very Low</td>
<td>Evidence for at least 1 critical outcome from unsystematic clinical observations or very indirect evidence</td>
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Recommendations
Practice recommendations were directed by the existing evidence and consensus amongst the content experts. Patient and family preferences were included when possible. The Content Expert Team and EBOC team remain aware of the controversies in the management of well-differentiated thyroid carcinoma in children. When evidence is lacking, options in care are provided in the clinical standard and the accompanying order sets (if applicable).

Approval Process
Clinical standards are reviewed and approved by hospital committees as deemed appropriate for its intended use. Clinical standards are reviewed as necessary within EBOC at Texas Children’s Hospital. Content Expert Teams are involved with every review and update.

Disclaimer
Practice recommendations are based upon the evidence available at the time the clinical standard was developed. Clinical standards (guidelines, summaries, or pathways) do not set out the standard of care and are not intended to be used to dictate a course of care. Each physician/practitioner must use his or her independent judgment in the management of any specific patient and is responsible, in consultation with the patient and/or the patient’s family, to make the ultimate judgment regarding care.

Version History

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