Clinical Practice Guidelines for Patients Undergoing Total Thyroidectomy

V5/20/15

Note: Patients undergoing lobectomy do not require calcium monitoring and supplementation.

For any questions that impact immediate patient care, call XXX.

Pre-operative care

- Send the following labs: 25-OH Vitamin D, PTH, TSH, free T4, Thyroglobulin and anti-Thyroglobulin antibody. These should be drawn 2 to 4 weeks prior to surgery.

- Optimization (25-OH-D level > 30 ng/mL) of vitamin D status should be pursued aggressively in the pre-operative phase.

  If 25-OH Vitamin D is >30ng/mL, No additional supplementation necessary.

  If 25-OH Vitamin D is 20-30ng/mL, Begin supplemental doses of vitamin D:
  If <1 year old, begin cholecalciferol 800 units daily
  If 1-12 years old, begin cholecalciferol 1000 units daily
  If >12 years old, begin cholecalciferol 2000 units daily

  If 25-OH Vitamin D is <20ng/mL, Give 50,000 IU of cholecalciferol orally one time and begin on higher replacement doses of vitamin D:
  If <1 year old, begin cholecalciferol 1000 units daily
  If 1-12 years old, begin cholecalciferol 2000 units daily
  If >12 years old, begin cholecalciferol 3000-5000 units daily

Post-operative care

ALL PATIENTS

Stat PTH assay near the end of the case - This defines the risk for hypocalcemia.

PTH > 20 pg/ml	➔ **Low risk** - follow calcium guideline below
PTH 10-20 pg/ml	➔ **Intermediate risk** - follow calcium guideline below, and *consider* oral calcitriol
PTH < 10 pg/ml	➔ **High Risk** – IV Calcitriol in the OR/PACU, and start oral calcium within 6 hours* Dose IV calcitriol for the first 24 hours, then shift to oral

- Send stat serum calcium, phosphorous and intact PTH 6 hours post-operatively for ALL patients undergoing total thyroidectomy.
  - follow total calcium every 6 hours until values have stabilized
- **Monitor for Signs of hypocalcemia** - peri-oral numbness, tingling of the hands or feet, muscle cramps and/or spasms (especially during measurement of blood pressure), stridor, laryngospasm (dysphagia or change in voice) or seizure. QT or QTc may be prolonged on EKG. Additional chronic symptoms include; fatigue, irritability, anxiety, and depression.

MEDICATIONS USED

Oral calcium dosing

For children < 30 kg, 250-500 mg elemental calcium 4 times daily
For children > 30 kg, 500-1000 mg elemental calcium 4 times daily

Begin oral calcium carbonate supplementation prophylactically in **all** patients once they are able to take PO. Please remind patients to take calcium with food/milk to maximize absorption and try to avoid taking at the same time as levothyroxine or cytomel therapy

NOTE: elemental calcium is 40% of the calcium carbonate dose. Please take this into consideration when both prescribing and administering calcium carbonate.

Available oral supplements

Inpatient pharmacy options

500mg calcium carbonate chews = 200mg elemental calcium
1250mg calcium carbonate tablet = 500mg elemental calcium

OTC - Calcium Carbonate (Tums or generic equivalent)

Tums Regular	*= 500mg calcium carbonate*	*= 200mg elemental Ca^{++}*
Tums Extra Strength	*= 750mg calcium carbonate*	*= 300mg elemental Ca^{++}*
Tums Ultra Strength	*= 1000mg calcium carbonate*	*= 400mg elemental Ca^{++}*

Oral calcitriol dosing

<3 yo 0.04 to 0.08 mcg/kg/day divided BID
<30kg 0.25 to 0.5 mcg 2x/day*
>30kg 0.5 to 1.0 mcg 2x/day*
** higher doses up to double the upper limits listed may be used initially in an effort to decrease time to effect.*
Remember that the clinical effect of calcitriol lags behind dose adjustment, so respond to calcium and phosphorous trends.

Additional Information

- Calcitriol is readily absorbed with peak serum levels detected at 3 to 6 hours. Mean serum half-life has not been well studied but may be as long as 27hrs. After multiple doses steady state levels are reached within 7 days.
- If persistent hypocalcemia, consider increasing calcitriol and/or calcium dose.
- *Ensure that the calcium is dosed with food and try to avoid simultaneous administration with levothyroxine*

Intravenous calcitriol dosing in the OR

< 5 yrs old	0.25 mcg x 1 dose
5-10 yrs old	0.5 mcg x 1 dose
> 10yrs old	1- 2 mcg x 1 dose

LOW RISK PATIENTS

(PTH > 20 pg/ml)

Medications

Begin oral calcium carbonate supplementation prophylactically in **all** patients once they are able to take PO.

For children < 30 kg, 250-500 mg elemental calcium 4 times daily

For children > 30 kg, 500-1000 mg elemental calcium 4 times daily

Monitoring

Send stat serum calcium, phosphorous and intact PTH 6 hours post-operatively for ALL patients.

Follow total calcium every 6 hours until values have stabilized

Monitor for symptoms and signs of hypocalcemia

When to Escalate Therapy

If Calcium is < 8 two checks in a row, then increase the daily calcium dose by 50%.

If Calcium is < 7.5, then begin calcitriol 0.5 mcg BID

INTERMEDIATE RISK PATIENTS

(PTH 10-20 pg/ml)

Medications

Begin oral calcium carbonate supplementation prophylactically in **all** patients once they are able to take PO. This should be within 6 hours of surgery and the resident should be informed if calcium dose is delayed beyond this.

For children < 30 kg, 500 mg elemental calcium 4 times daily

For children > 30 kg, 1000 mg elemental calcium 4 times daily

Consider using higher dose oral calcium (50 – 150 mg/kg/day elemental calcium) if significantly downward trending iCal*

Consider starting oral calcitriol at the lower end of the ranges listed above if iCal is trending downwards

Monitoring

Send stat serum calcium, phosphorous and intact PTH 6 hours post-operatively

- follow total calcium every 6 hours until values have stabilized

When to Escalate Therapy

If calcium is < 8 two checks in a row, then increase the daily calcium dose by 50%.

If calcium is <7.5, start calcitriol 0.5 mcg BID oral calcitriol will be started.

HIGH RISK PATIENTS

PTH < 10 pg/ml
(Consider following this protocol initially in patients with a significant intraoperative drop in PTH)

Medications

Intravenous calcitriol

Intravenous Calcitriol should be given in PACU prior to returning to the ward

< 5 yrs old	0.25 mcg x 1 dose
5-10 yrs old	0.5 mcg x 1 dose
> 10yrs old	1 to 2 mcg x 1 dose

Oral calcitriol

<3 yo 0.04 to 0.08 mcg/kg/day divided BID
<30kg 0.25 to 0.5 mcg 2x/day*
>30kg 0.5 to 1.0 mcg 2x/day*
** higher doses up to double the upper limits listed may be used initially in an effort to decrease time to effect.*
Remember that the clinical effect of calcitriol lags behind dose adjustment, so respond to calcium and phosphorous trends.

Oral Calcium Carbonate

Use higher dose oral calcium (150 mg/kg/day, up to 1000mg elemental calcium 4 times a day) in all high risk patients.

Calcium Carbonate should be given as soon as possible in these patients as they are at high risk of requiring intravenous calcium if prophylactic therapy is delayed.

Monitoring

Send stat serum calcium, phosphorous and intact PTH 6 hours post-operatively for ALL patients undergoing total thyroidectomy.

- follow total calcium every 6 hours until values have stabilized

Monitor for symptoms and signs of hypocalcemia.

When to Escalate Therapy

If calcium is <8, increase calcium dose by 50%
If calcium is < 7.5, double the dose of calcitriol.
If calcium is < 7 and the patient is not symptomatic, give oral dose of calcium plus some food immediately.
Repeat calcium check in 2 hours.
If Calcium is < 7 and the patient is symptomatic, treat as below:

SYMPTOMATIC HYPOCALCEMIA

Administer slow **IV infusion** (***NOT a bolus***) of **calcium gluconate** 100 mg/kg/dose x 1 administered over 4 hours (equivalent to 2.5 mg/kg/hr of elemental calcium)

IV calcium infusions should be administered with the patient on telemetry. Location is dependent on floor policy and after discussion with the nursing leadership, staff and attending physician. Ensure IV calcium is infused only through large veins; ***avoid hand, foot, and/or scalp veins***.

Repeat stat calcium measurement 2 hours after completion of the calcium gluconate infusion and continue to monitor closely until stable calcium is achieved.
Initiate or continue maximum oral calcium while calcium gluconate is infusing and **begin therapy with calcitriol if it has not already been initiated.**

Repeat IV calcium dose if patient remains symptomatic and/or corrected calcium remains < 7 mg/dL. If multiple repeat doses are required consider placing patient on a continuous IV calcium infusion.

Discharge Care

Calcium Management:

Patients must have stable serum calcium levels >8.0mg/dL or ionized calcium levels >1.1 mmol/L for at least two checks separated by 6-8 hours to be considered "stable for discharge".

All patients with hypocalcemia during their hospitalization should have a repeat serum calcium measurement as an outpatient within 3 days of discharge.

Follow-up lab orders should include *Calcium, Phosphorous, PTH*

Other Considerations:

The majority of patients should be discharged on 3x/day calcium dosing

For patients with serum calcium levels > 8.5 mg/dL or >1.1 mmol/L at the time of discharge (or in those with upward trending calcium), consider de-escalation of the prophylactic calcium replacement plan.

Ensure patients are instructed to separate calcium supplementation and thyroid hormone (either levothyroxine or cytomel) by 30-60 minutes.

Vitamin D supplementation (cholecalciferol)

Vitamin D replacement therapy should be continued for all patients that were placed on it prior to surgery