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Evaluation of Calcitonin Use for Hypercalcemia at Parkview Health

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OBJECTIVE

- Evaluate the appropriateness of calcitonin use for hypercalcemia at Parkview Health, a not-for-profit community hospital health system

BACKGROUND

- Hypercalcemia is an oncologic emergency that occurs in up to 30% of patients with active malignancy[1] and can lead to life-threatening consequences, like arrhythmias and comas.[2]
- It is also a common manifestation of hyperparathyroidism.[3]
- First-line treatment for hypercalcemia is rapid volume expansion with intravenous (IV) crystalloid fluids[3], followed by bisphosphonates.[4]
- Calcitonin is an appropriate second line option for patients with severe and symptomatic hypercalcemia that has not been corrected by first-line therapies.[3] RANK-L inhibitors are an alternative second line option.[5]
- The mechanism of action of calcitonin is the inhibition of bone resorption and increased excretion of electrolytes by decreasing calcium and phosphorus reabsorption in the kidney.[4]
- Calcitonin is available as an injectable product and an intranasal product. Only the injection is appropriate for treatment of hypercalcemia. The recommended dosing is 4 units/kg subcutaneously every 12 hours.[6]

METHODS

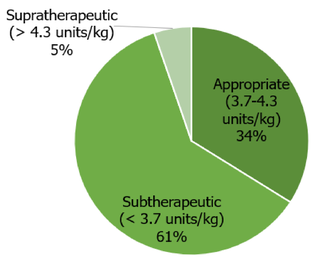
- Retrospective analysis conducted within 8 community hospitals
- Inclusion criteria:
  - Received at least one dose of nasal or injectable calcitonin from January 1, 2019 to December 31, 2020 at any hospital within the Parkview Health system
- Exclusion criteria:
  - Patients < 18 years of age
  - Use for non-hypercalcemic indication
  - Received nasal calcitonin on an outpatient basis
  - Chronic hemodialysis patient
- Data was extracted from the institution's electronic medical record and manually validated
- Patients were classified based on corrected calcium value:
  - Mild hypercalcemia: 10.5-11.9 mg/dL
  - Moderate hypercalcemia: 12-13.9 mg/dL
  - Severe hypercalcemia: > 14 mg/dL
- Presence of clinical manifestations of hypercalcemia were manually recorded via chart review (hypertension, bradycardia, excess urine output, nephrolithiasis, vomiting, acute kidney injury (AKI), and altered mental status)
  - AKI was defined as an increase in serum creatinine by 1.5 times baseline or increase by 0.3 mg/dL in 48 hours
  - Hypertension and bradycardia were defined as at least 2 episodes of SBP > 130 mmHg or DBP > 80 mmHg or HR < 60 bpm, respectively
- Concomitant and previous utilization of IV fluids, bisphosphonate, and RANK-L inhibitor use(s) were recorded to assess appropriate place in therapy relative to calcitonin doses

RESULTS

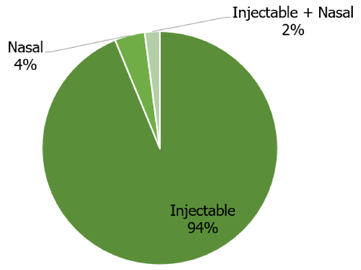
- 118 patients screened for inclusion, 21 excluded → 97 patients included in analysis
  - Most (81%) excluded patients received calcitonin for osteoporosis

Baseline Characteristic	Study Population (N = 97)
Mean age (yr, SD)	67.8 ± 13.2
Mean weight (kg, SD)	81.9 ± 30.3
BMI Classification (n)	
Underweight	7
Healthy weight	30
Overweight	27
Class 1 obesity	15
Class 2 obesity	10
Class 3 obesity	8
Female sex (n, %)	55 (56.7%)
Mean albumin (g/dL, SD)	3.55 ± 0.66
Mean serum corrected calcium (mg/dL, SD)	13.9 ± 1.8
Hypercalcemia grade based on corrected calcium (n)	
Mild	14
Moderate	35
Severe	48
Mean serum creatinine (mg/dL, SD)	1.46 ± 0.99
Presence of chronic kidney disease (n, %)	40 (41.2%)
Presence of active malignancy (n, %)	49 (50.5%)

Calcitonin Initial Dosing

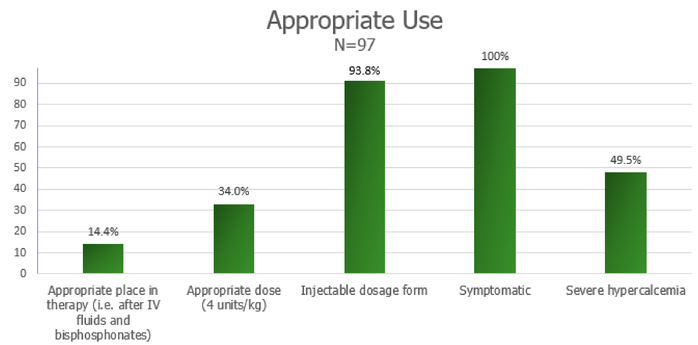


Calcitonin Dosage Form



Clinical Manifestation	Study Population (N = 97)
Hypertension	90 (92.8%)
Acute kidney injury	74 (76.3%)
Altered mental status	59 (60.8%)
Vomiting	32 (32.9%)
Bradycardia	26 (26.8%)
Urine output ≥ 3 L/day	26 (26.8%)
Nephrolithiasis	13 (13.4%)

RESULTS



DISCUSSION & CONCLUSIONS

- Fourteen (14.4%) patients were classified as having severe, symptomatic hypercalcemia refractory to first-line therapies, thus appropriate for calcitonin administration
- No patients in this population received a RANK-L inhibitor, which is expected, as these agents are restricted to outpatient use per hospital policy
- Based on this medication use evaluation, there is opportunity for process improvement to standardize care
  - Limiting calcitonin to second line use will promote guideline management of hypercalcemia and yield significant cost savings
  - Eliminating nasal calcitonin use for hypercalcemia will avoid delays in appropriate care
- Limitations:
  - Use of manual chart search to identify clinical manifestations is limited by variable phrasing used by physicians that differs from the predefined chart search terms
  - Many patients were discharged before achieving eucalcemia, resulting in difficulty assessing overall calcitonin efficacy
- Dosing protocols are needed to promote the appropriate use of injectable calcitonin for hypercalcemia

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Disclosure
The authors of this presentation have the following to disclose concerning possible financial or personal relationships with commercial entities that may have a direct or indirect interest in the subject matter of this presentation:
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