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## Introduction

- Up to 1/3<sup>rd</sup> of cancer patients will experience hypercalcemia
- Providers are encouraged at University Hospitals Cleveland Medical Center to use the hypercalcemia of malignancy order set

### Hypercalcemia of Malignancy Order set Algorithm

Order set Input	Order set Output
Mild	Normal Saline
Mild + Symptomatic	Pamidronate 90 mg x1*
Moderate	Pamidronate 90 mg x1*
Moderate + Symptomatic	Pamidronate 90 mg x1 + calcitonin*
Severe	Zoledronic acid 4 mg x1*
Severe + Symptomatic	Zoledronic acid 4 mg x1 or pamidronate 90 mg x1 + calcitonin*
Bisphosphonate Refractory or Contraindication	Denosumab + calcitonin

\*Pamidronate 60 mg IV once given if CrCL<30 mL/min  
Corrected Calcium: < 12 mg/dL mild, 12-14 mg/dL moderate, >14 mg/dL severe

## Methods

- This is a single-center, retrospective chart review conducted from September 1<sup>st</sup>, 2021 to September 1<sup>st</sup>, 2023
- All objectives were recorded during an admission for which patients were diagnosed with hypercalcemia:
  - Primary:** Use of hypercalcemia of malignancy order set
  - Secondary:** Corrected calcium at 72 H after bisphosphonate use

Inclusion Criteria	Exclusion Criteria
<ul style="list-style-type: none"> <li>Age 18-89 years old</li> <li>Hypercalcemia diagnosed inpatient</li> <li>Cancer diagnosis</li> </ul>	<ul style="list-style-type: none"> <li>Bisphosphonates used for an indication other than hypercalcemia</li> </ul>

## Results

Table 1. Demographics	All Patients N=42
Age, years, median (IQR)	68 (61-75)
Male Sex, n (%)	20 (48)
Primary Malignancy Site, n (%)	
Hematologic*	7 (17)
Breast	6 (14)
Lung	6 (14)
Other**	23 (55)
Hypercalcemia Chief Complaint, n (%)	18 (43)
Mild Hypercalcemia, n (%)	9 (21)
Moderate Hypercalcemia, n (%)	18 (43)
Severe Hypercalcemia, n (%)	15 (36)

\*3 Multiple Myeloma \*\*9 Genitourinary, 6 carcinoma, 3 sarcoma, 2 gynecologic, 2 pancreatic, 1 liver

## Results

### Primary Objective

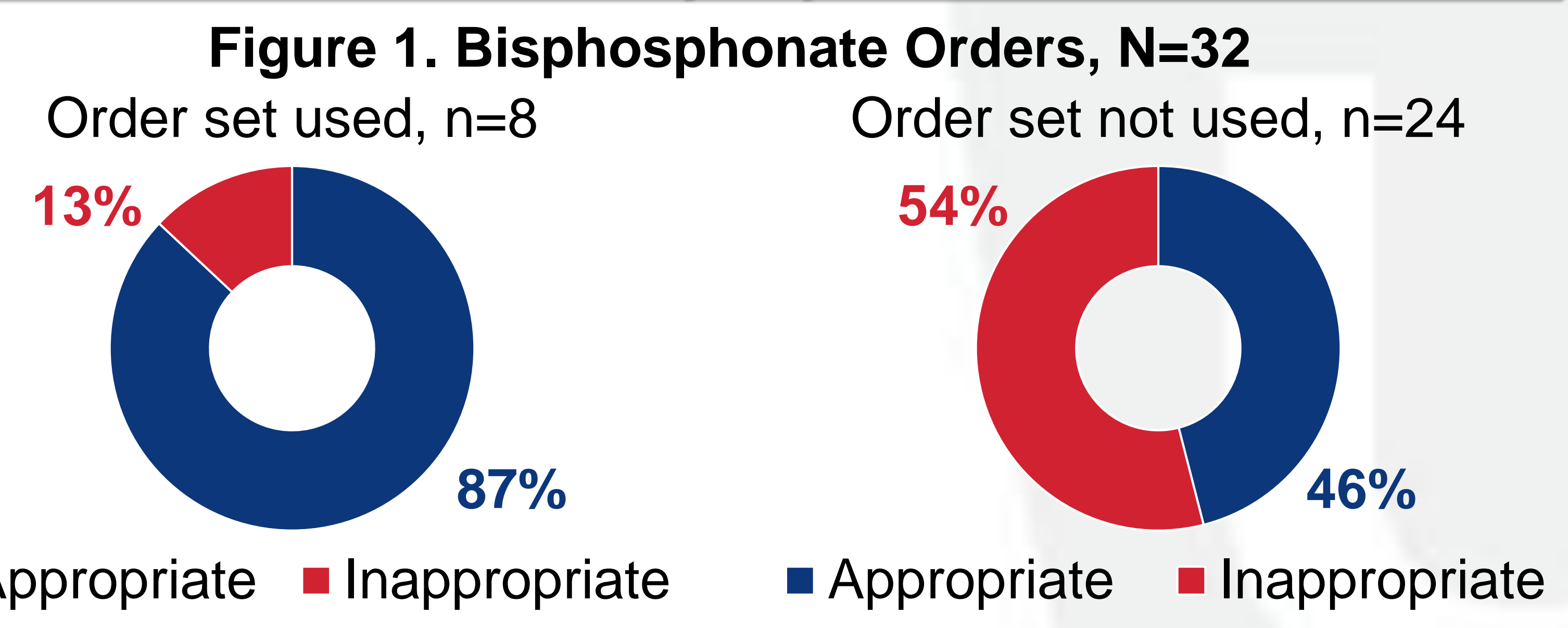
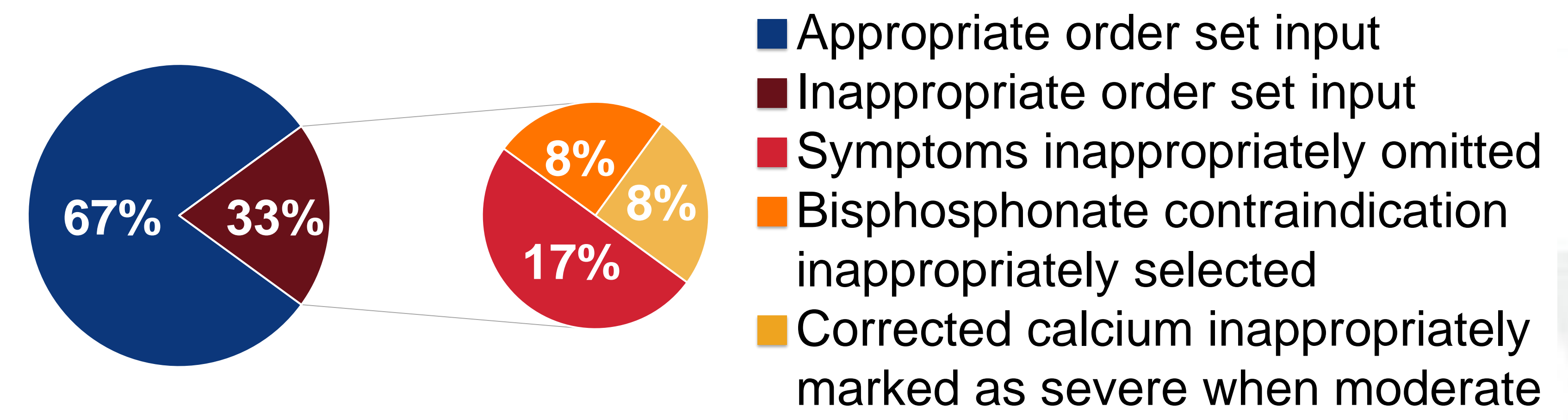


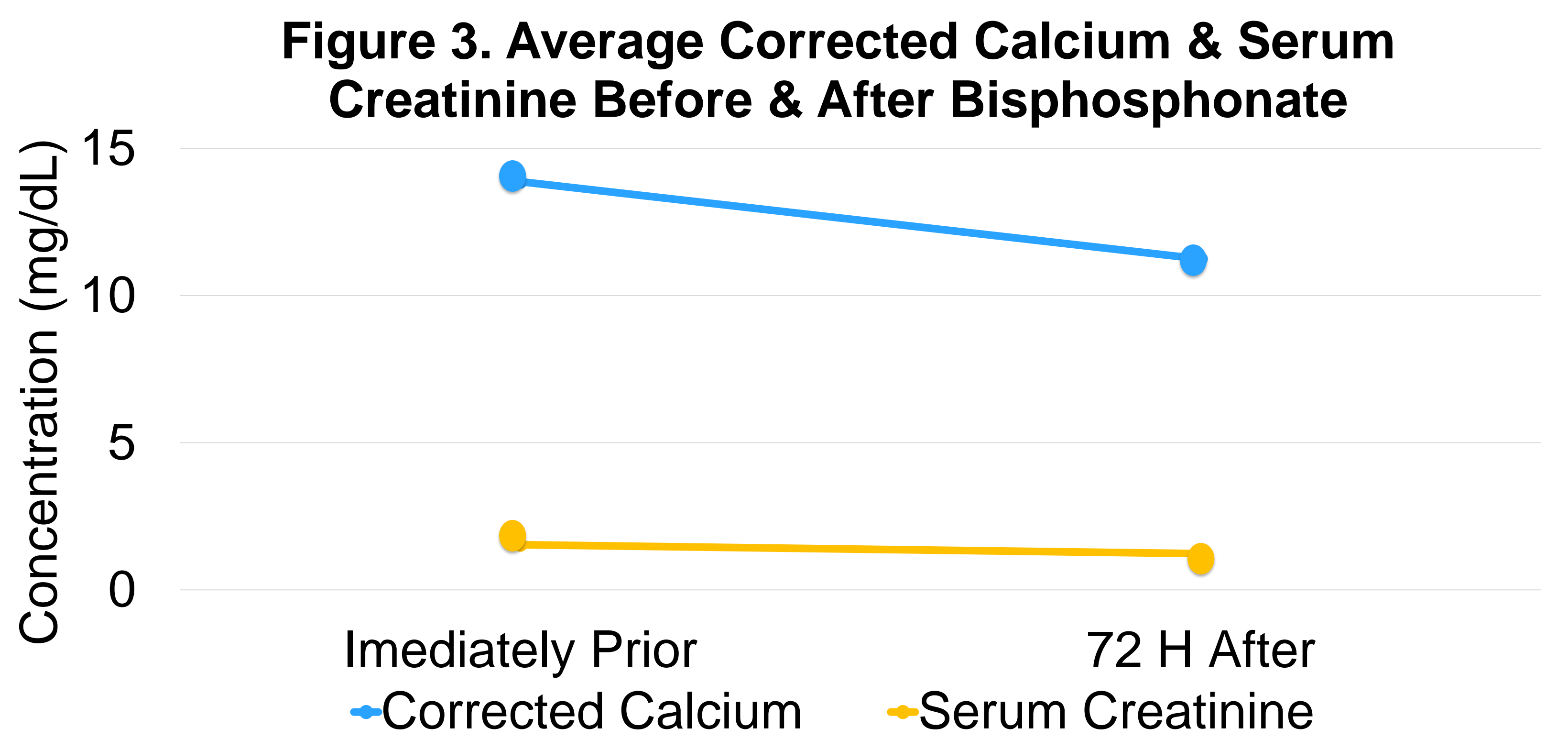
Table 2. Inappropriate Bisphosphonate Orders per Order set Algorithm, n (%)	All Patients N=42
Bisphosphonate omitted when indicated	6 (14)*
Dose selected is lower than recommended	4 (10)
Bisphosphonate given when NOT indicated	3 (7)
Zoledronic acid given when pamidronate indicated:	7 (17)
Pamidronate 90 mg indicated	6 (14)
Pamidronate 60 mg indicated	1 (2)
Duplicate orders (1 inside order set, 1 outside)	2 (5)

\*1 additional patient not accounted for in the 6 did not have a bisphosphonate ordered within the order set but a bisphosphonate was ordered later outside order set as indicated

### Figure 2. Order set Input, N=12

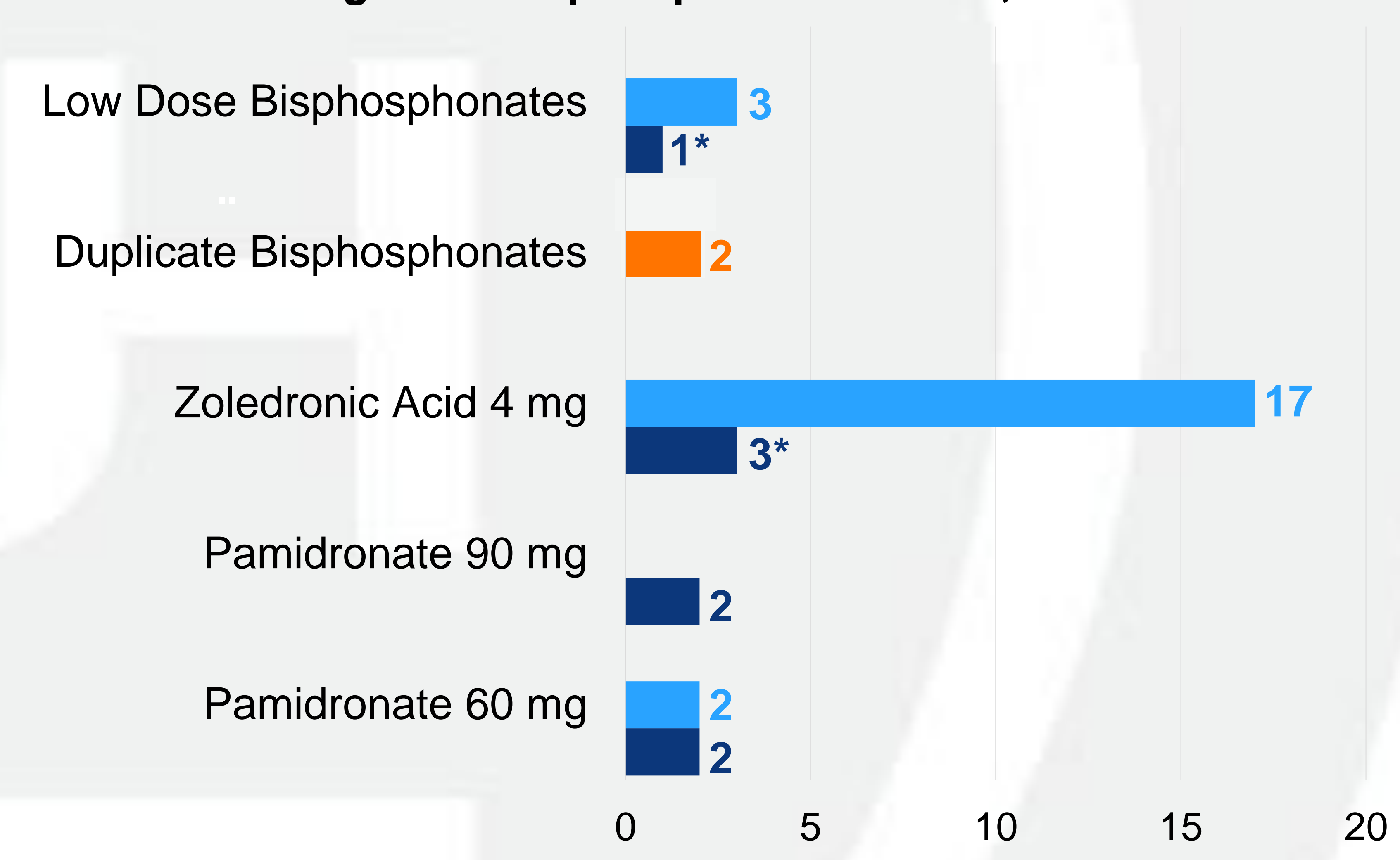


### Secondary Objective



## Results

### Figure 4. Bisphosphonate Orders, N=32



■ Both in & outside order set ■ Outside order set ■ Inside order set  
\*Patients with duplicate orders counted twice (1 count for initial order & 1 for duplicate order)

Table 3. Non-Bisphosphonate Orders	All Patients N=42
Calcitonin orders, n (%)	19 (45)
Doses administered, median (IQR)	2 (2-3)
Denosumab orders, n (%)	1 (2)

## Conclusions & Future Opportunities

- Bisphosphonate orders were placed via order set in <25% of patients (>50% followed order set algorithm with appropriate input)
- When bisphosphonate orders were placed outside of the order set, the majority did not follow the order set algorithm:
  - Bisphosphonates were more likely to be given when not indicated
  - Zoledronic acid was ordered more frequently when pamidronate was indicated
  - Duplicate orders were entered outside of the order set
- Future opportunities include providing education to increase awareness of the order set, ensure order set is user-friendly/ address barriers to use, & re-assess the role of zoledronic acid versus pamidronate within the order set

## Disclosure & References

Authors of this presentation have no financial interests to disclose.

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