PN-associated metabolic bone disease: Are there practice gaps in calcium dosing to minimize risk?

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Background

Metabolic bone disease (MBD) is common among patients receiving long-term parenteral nutrition (PN) and may lead to debilitating sequelae of functional status and quality of life. The most common types of MBD are osteoporosis, osteomalacia, and primary hyperparathyroidism. Incidences of PN-associated MBD may be 40% to 100% in this population. Clinical manifestations may include hypercalcemia, hyperphosphatemia, hypercalciuria and an increase in alkaline phosphatase. Intestinal failure patients may have a higher risk of MBD due to malabsorption, renal calcium (Ca) wasting and metabolic acidosis. The purpose of this abstract is twofold: To identify obstacles nutrition support clinicians (NSCs) face in meeting Ca needs for long-term PN adult patients, and to assess potential practice gaps in minimizing risk of MBD.

Methods

An 8-question survey was created using an online software tool. Target audience included NSCs across the nation who manage long-term PN adult patients. A link to the survey was sent to NSCs by email and professional organization social media platforms. NSCs who do not manage long-term PN adult patients were excluded. The responses were analyzed using descriptive statistics.

Results

Thirty-one survey responses were included in the analysis. Ca dosing in PN was most prevalent at 6-10 mEq/day compared to ASPEN guidelines of 10-15 mEq/day (Table 1). Most NSCs assessed Ca dosing based on serum or corrected Ca (Figure 1). The most challenging limitations to meeting optimal Ca dosing included Ca: Phosphorus (P) ratio (32%) and Ca drug shortages (29%). Of note, there were no national Ca drug shortages at time of survey. The majority of NSCs checked ionized Ca due to low serum or corrected Ca and 23% did not check ionized Ca (Table 1). To minimize risk of MBD, only 35% of NSCs dosed amino acids (AA) at maintenance level of 0.8-1.2 gm/kg/day. Almost half (48%) dosed AA at anabolic level of 1.2-1.5 gm/kg/day, which may contribute to MBD. Formula modifications were prioritized to minimize MBD by correcting metabolic acidosis, providing adequate magnesium (Mg), and minimizing aluminum (Al) containing additives (Figure 2).

Conclusion

NSCs must be knowledgeable of PN-associated MBD and strategically dose PN to minimize risk. Optimizing Ca in PN is crucial for bone mineralization and prevention of MBD. However, current practice may provide less than ASPEN's recommended Ca dosing of 10-15 mEq/day. Ca drug shortages were cited as a challenging limitation to meeting Ca needs in PN, but there were no shortages at that time. It is critical NSCs return to ASPEN PN dosing recommendations once shortages resolve. NSCs may also need to utilize ionized Ca more frequently for a more accurate assessment of Ca status.

NSCs should adjust to maintenance dosing of AAs as soon as clinically appropriate since anabolic provision can induce unnecessary urinary Ca losses. The majority of NSCs are aware of the need to correct metabolic acidosis, provide adequate Mg and minimize Al contamination to prevent MBD. Fewer are aware of need to provide adequate copper and avoid excessive sodium.

Future evidenced-based research, shared clinical experiences, and educational opportunities on PN-associated MBD are warranted to decrease risk and prevent this often unforeseen complication in the long-term PN adult patient.

Survey question	% (No.)
What is your typical calcium dosing for long-term PN adult patients?	
6-10 mEq/day	61% (19)
11-15 mEq/day	29% (9)
0-5 mEq/day	6% (2)
16-20 mEq/day	3% (1)
More than 20 mEq/day	0% (0)
When do you check ionized calcium? Select all that apply.	
Low corrected calcium	65% (20)
High corrected calcium	29% (9)
Low serum calcium	26% (8)
Never	23% (7)
Low serum vitamin D	19% (6)
High serum calcium	16% (5)
High PTH	13% (4)
High serum phosphorus	10% (3)
Low serum phosphorus	10% (3)
Routinely (e.g., once/month) for all patients	3% (1)

Table 1. Calcium dosing practices and ionized calcium monitoring

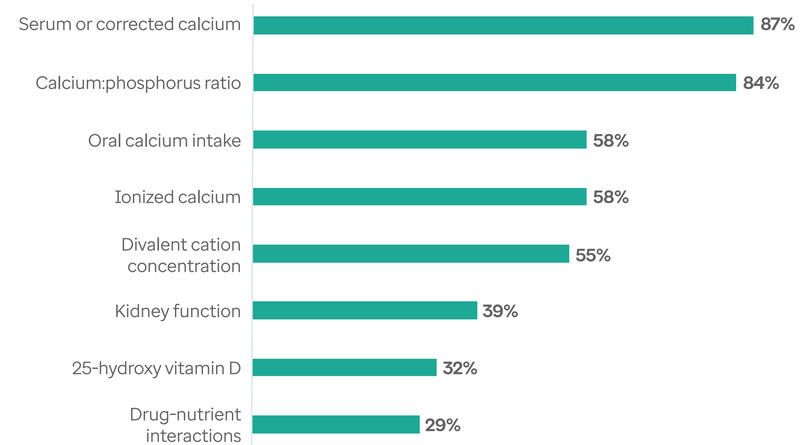

Figure 1. Clinician considerations when assessing calcium dosing

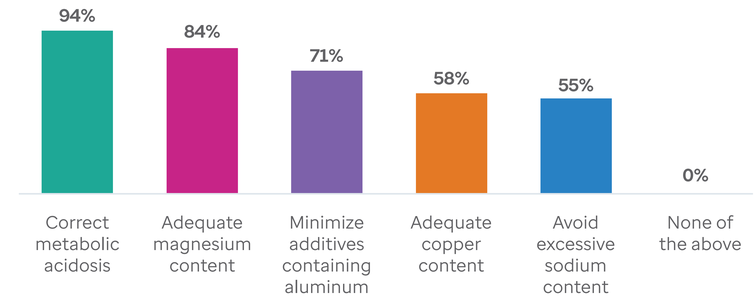

Figure 2. PN formula modifications implemented to minimize risk of PN-associated MBD

* Respondents could select all that apply.