Bone Health in Pediatric Patients: A Multicenter Study of Bisphosphonate Utilization

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Introduction

- Pediatric disease processes and treatments can impact bone mass accrual and health, increasing lifetime fracture risk if optimal peak bone mass isn't reached.
- As the field of pediatric bone disorders advances, a survey on bone disorder management revealed low clinician confidence in addressing pediatric metabolic bone and mineral disorders due to inadequate training.
- Lurie Children's Hospital serves as a unique model for managing bone health with multiple management protocols.
- A study by Lurie Bone Health highlighted the inconsistency in bisphosphonate (BP) protocols among physicians and institutions.
- Bisphosphonates are prescribed for many diagnoses related to bone fragility in pediatric patients but have only been FDA-approved for osteogenesis in adults.

Aim

Develop evidence-based best practice protocols using the identified differences to optimize pediatric bone health

Methods

1. ***Database Creation:*** Use REDCap to create a database and perform a retrospective review of pediatric patients treated with bisphosphonate (BP) since 2013 at Lurie Children's.

2. ***Data Collection:*** Include information on sex race, ethnicity, age distribution, family history, insurance, ambulatory status, BP medication, and diagnoses.
   Future Data Collection: Demographics, BP dosing intervals, adverse events, disease activity measures (e.g., change in inflammatory markers, ambulatory status), diet, fracture history, duration of BP use, laboratory results, glucocorticoid use, developmental history/changes, BP used, BP doses, diagnoses, indications for BP use, BMD, incident fractures, pain assessment, and activity history/limitations.

3. ***Data Analysis:*** Over two years, protocols and data from all institutions will be compared to determine trends. A medication-based approach will be used to identify differences in practice by diagnosis or risk factor.
   Diagnosis Examination: The diagnoses requiring BP treatment include idiopathic juvenile osteoporosis, spinal muscular atrophy, Duchenne muscular dystrophy, osteogenesis imperfecta, spastic quadriplegia, solid organ transplantation, stem cell transplantation, hypercalcemia, and chronic recurrent multifocal osteomyelitis, among any other identified treating diagnoses.

Results

Table 1. Patient Characteristics

	All Patients, *N* = 30
Sex, *n* (%)	
Male	18 (60)
Female	12 (40)
Race, *n* (%)	
American Indian / Alaska Native	0 (0)
Asian	2 (7)
Native Hawaiian or Pacific Islander	0 (0)
Black or African American	4 (13)
White	21 (70)
Unknown or not reported	3 (10)
Ethnicity, *n* (%)	
Hispanic	6 (20)
Non-Hispanic	24 (80)
Family history, *n* (%)	
Osteoporosis	8 (26.67)
OI	0 (0)
Other	4 (13.33)
Unknown	18 (60)
Insurance, *n* (%)	
Self-pay	0 (0)
Medicaid	6 (20)
Medicaid Managed Care	0 (0)
Private Insurance	24 (80)
Ambulatory Status, *n* (%)	
Ambulatory	14 (46.67)
Partially Ambulatory	2 (6.67)
Non-Ambulatory	14 (46.67)

Figure 3. Bisphosphonate Dosage

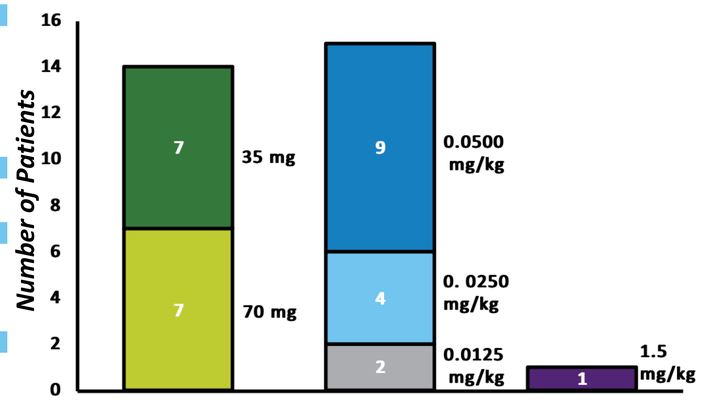


Figure 1. Age Distribution of 30 Pediatric Patients Treated with Bisphosphonates

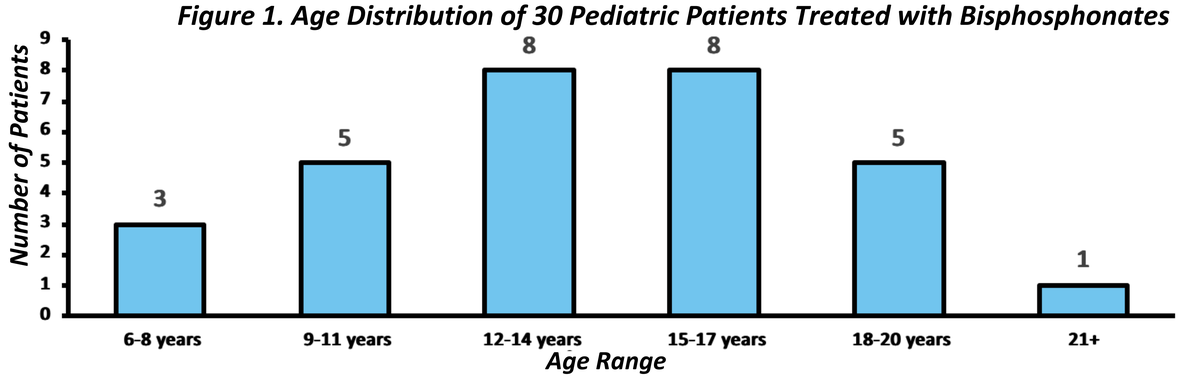
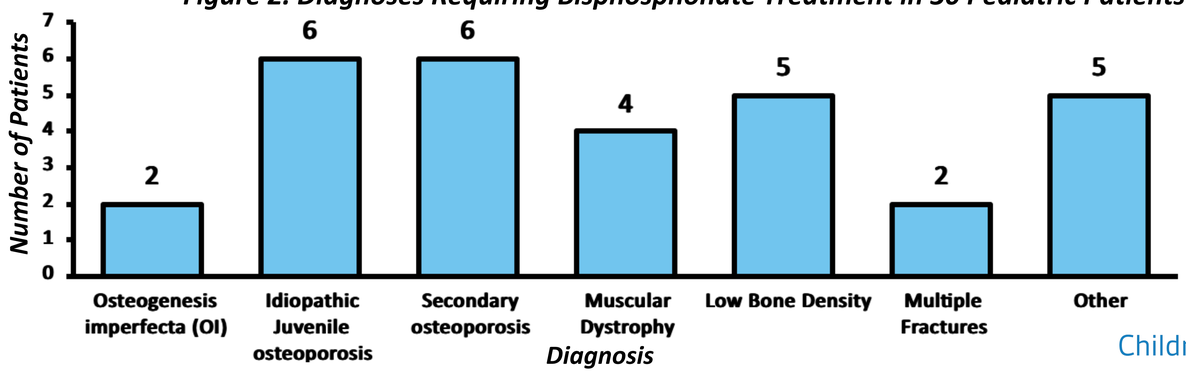


Figure 2. Diagnoses Requiring Bisphosphonate Treatment in 30 Pediatric Patients



Conclusion

- Our preliminary findings from the analysis of 30 patients highlight a demographic diversity of pediatric patients being treated with BP at Lurie Children's.
- Multiple diagnosis require BP treatment in pediatric patients, and also dosage varies.
- This variability in BP treatment practices among pediatric patients is supported by previous research.
- These early results emphasize the need for more standardized treatment guidelines and suggest that more extensive data collection and analysis are necessary to develop evidence-based protocols.

Discussion

- Limitations:
  - Sample Size: Data from only 30 patients treated with BP at Lurie, whereas the full database is expected to include an additional 120 patients from Lurie and patients from other medical centers.
  - Variables: Only by looking at 10 variables. Future data analysis will look at a greater range.
- The project is currently in the data entry phase at Lurie along with other institutions: Boston Children's Hospital- Harvard University, Children's Hospital of Philadelphia/CHOP, Lucile Packard Children's Hospital/Stanford, Oklahoma Children's Hospital, University of Tennessee, UT Southwestern Medical Center, Nationwide Children's, Children's Hospital Los Angeles/CHLA, Helen DeVos Children's Hospital, Children's Nebraska, and Shriners Pasadena.
- Future analysis of retrospective data will provide a positive impact on pediatric patients across the country to provide better care practices:
  - Identify gaps in clinical care to improve outcomes of pediatric patients who receive bisphosphonate treatment
  - Design future fundable studies to improve the gaps
  - Standardize current practices and protocols
  - Prevent adverse events

Acknowledgements & References

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