Reducing the Risk of Fracture in Patients with Metabolic Bone Disease in a Level IV Neonatal Intensive Care Unit Using Quality Improvement

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Introduction

- Metabolic bone disease (MBD) of prematurity is a significant cause of morbidity in chronically ill, preterm, and low birth weight infants.
- Studies report poor bone mineralization in up to 55% of infants less than 1000 grams and in 23% less than 1500 grams at birth.
  - Approximately 80% of bone mineral stores accumulate during the last trimester of intrauterine development.[1]
  - The mineral deficiencies preterm infants experience at birth coupled with difficulty optimizing nutrition lead to the development of MBD.[2]
- MBD is not limited to preterm infants.
- Risk factors in both term and preterm infants include:
  - Prolonged administration of high-risk medications or parenteral nutrition.
  - Small-for-gestational age and/or intrauterine growth restriction.
  - Surgical necrotizing enterocolitis, malabsorption, and short bowel syndrome.[3]

Aim Statement

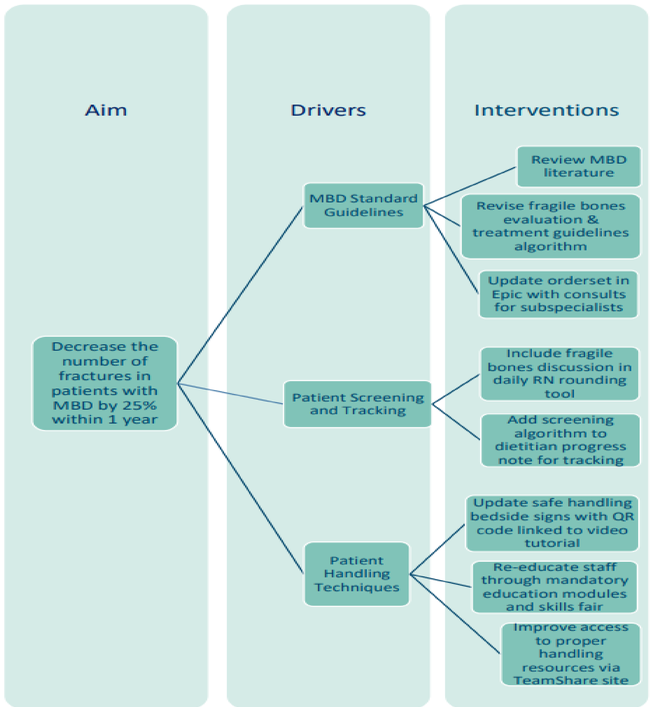
This quality improvement project aims to reduce the number of fractures in patients with MBD cared for in our Level IV Neonatal Intensive Care Unit (NICU) by 25% by June 2022.

Methods

- An interdisciplinary workgroup consisting of neonatologists, nurse practitioners, fellows, nurses/nursing leadership, dietitian, pharmacist, physical and occupational therapists was organized in October 2018.
- Screening and treatment criteria for infants at risk for or with the diagnosis of MBD were developed by the workgroup and implemented in the NICU from 2018-2021.
- Due to an increase in fractures in patients with MBD, the workgroup reconvened in April 2021.
- Using the Institute for Healthcare Improvement (IHI) Model for Improvement, we identified key drivers and developed interventions to accomplish our aim of reducing fractures (Figure 1). These change ideas were introduced in the NICU starting June 1, 2021.
- IRB approval was not required for this quality improvement project.

Methods (continued)

Figure 1: Key Driver Diagram

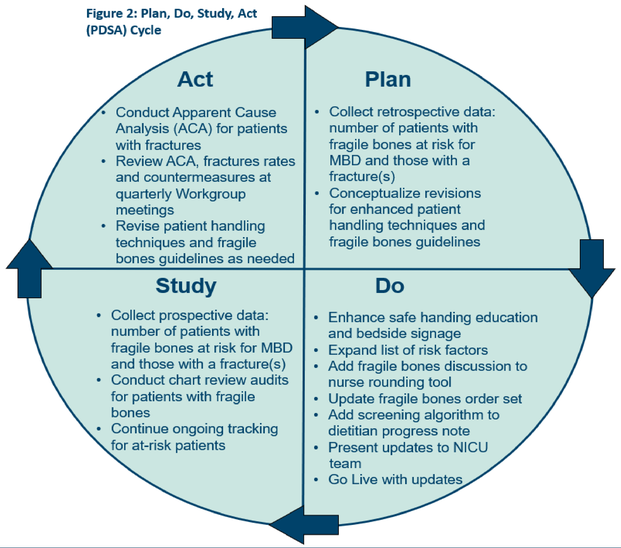


Results

- Data collection includes a chart review of all patients at risk for or with MBD starting in October 2018.
- Retrospective data will be compared to data collected during our interventions.
  - Reduction in the rate of fractures will be tracked by determining the total number of patients with MBD and the total number of those patients with fractures.
  - Compliance with the use of the revised standardized guidelines will be tracked.
  - No patient identifiers will be collected.
- We are currently in the "Study" phase as depicted in our PDSA cycle (Figure 2).
- Compliance with fragile bone precautions increased from 18% (28/156) to 100% (31/31) with our interventions.

Results (continued)

Figure 2: Plan, Do, Study, Act (PDSA) Cycle



Discussion

- To reduce the number of fractures in NICU patients with MBD, we expanded the criteria used to identify all patients at risk and enhanced our handling guidelines.
- Data collection is ongoing at present so we are unable to predict the impact of our interventions on the number of fractures.
- We have shown an improvement in adherence to fragile bones precautions with our quality improvement interventions.
- We expect these interventions will continue to lead to more prompt identification of at-risk patients and thus allow for earlier treatment and prevention of fractures in patients with MBD in this Level IV NICU.

References

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