IMPROVED ADHERENCE TO VITAMIN D GUIDELINES FOR EXCLUSIVELY AND PARTIALLY BREASTFED NEWBORNS

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Introduction

- Vitamin D essential for bone health (Drury et al., 2015)
- Deficiency r/t wide range of disease conditions:
  - Hypocalcemic seizures
  - Growth disturbances
  - Rickets (Drury et al., 2015)
- Rickets rare in US (Thacher et al., 2012)
  - Breastfeeding w/o vitamin D supplementation risk factor (Holick et al., 2011)
  - Incidence increased over past decades (Thacher et al., 2012)
    - 100% children were < 3 y/o & 59% were black (Thacher et al., 2012)

Introduction

- The American Academy of Pediatrics (AAP) recommends daily intake of 400 IU/day vitamin D for all infants beginning in first few days of life for prevention of rickets & vitamin D deficiency (AAP, 2008)
- An “increasing concern that vitamin D deficiency poses a major health problem for children” (Drury et al., 2015)
  - Adherence to AAP vitamin D guidelines low (Perrine et al., 2010; Simon & Ahrens, 2020)
  - Strategies to improve vitamin D supplementation in breastfed infants are needed (Thacher et al., 2012)

Problem Statement

- Norton Children's Neonatology Newborn Team does not recommend or prescribe vitamin D supplementation at time of discharge
- Opportunity for improvement in health promotion efforts & quality of care
- Educational problem (i.e., lack of adherence to an evidence-based practice guideline) impacting clinical practice & outcomes
- Adherence among providers remains low despite evidence supporting effectiveness of vitamin D supplementation in breastfed newborns
- Focus on population (i.e., exclusively and partially breastfed newborns)

Purpose and Objectives

- Purpose:
  - Implement standardized order set for prescribing vitamin D supplementation for exclusively & partially breastfed newborns consuming < 1 L vitamin D fortified formula per day at time of discharge
  - Evaluate effectiveness on provider adherence to current AAP recommended guidelines for vitamin D supplementation for exclusively & partially breastfed newborns
- Objectives:
  - 1. Create & implement standardized discharge order set
  - 2. Improve provider adherence to current AAP guideline recommendations (>/= 90%) w/in two weeks
  - 3. Use Norton Healthcare's "Meds-to-Beds" program
  - 4. Provide newborn parents & families w/ verbal & written education
  - 5. Evaluate effectiveness of interventions

Background

- Updated AAP guideline recommends 400 IU/day vitamin D supplementation for all infants consuming < 1 L vitamin D fortified formula per day (2008)
  - AAP (2008), CDC (2021) & WHO (2021) recommend exclusive breastfeeding for all infants for at least first six months of life
  - Breastmilk does not contain adequate amount of vitamin D (CDC, 2021)
  - Breastfeeding is risk factor for vitamin D deficiency & rickets in newborns (Holick et al., 2011)
- Norton Children's Neonatology Newborn Team
  - Newborn nurseries at Norton Women's and Children's Hospital & Norton Hospital in Louisville, KY
  - Most newborns are exclusively or partially breastfed

Concepts

- Adherence
  - Practice of following evidence-based practice guideline (Runnacles et al., 2018)
- Vitamin D deficiency
  - Serum 25 (OH) D level < 50 nmol/L (Holick et al., 2011)
  - *Rickets* is severe form of vitamin D deficiency (Wagner et al., 2008)
- Exclusively breastfeeding
  - Newborns who receive only breast milk for nutrition (CDC, 2020)
- Partially breastfeeding
  - Newborns who receive breast milk & are fed < 1 L vitamin D fortified formula per day (Wagner et al., 2008)

Concepts

- Evidence-based practice guideline
  - Statement and/or set of recommendations for prevention, management, and/or treatment of specific disease or condition based on best available research evidence used to assist & support clinical decision-making & promote safe, quality, effective care (Field et al., 1990)
- Standardized order set
  - Set of automated orders w/in electronic health record (EHR) used to provide clinical decision support & optimize provider workflow (Stultz & Nahata, 2012)

Framework

- Pathman et al.'s (1996) Awareness-to-Adherence model
- Awareness
  - Assess provider knowledge of AAP vitamin D supplementation guidelines
- Agreement
  - Assess provider agreement or disagreement w/ current AAP vitamin D supplementation guidelines
- Adoption
  - Create & implement standardized discharge order set for prescribing vitamin D supplementation for exclusively & partially breastfed newborns
- Adherence
  - Evaluate effectiveness of interventions on provider adherence rates post-implementation (i.e., goal >/= 90%)

PICOT Question

- For exclusively and partially breastfed newborns (P), does the use of a standardized discharge order set for prescribing vitamin D supplementation (I) compared to current practice standards (i.e., no discharge order set) (C) improve AAP recommended vitamin D supplementation guideline adherence rates among providers (O) within two weeks (T)?

Synthesis of the Evidence: Evidence Search

- Review of literature was conducted between January and March 2021
  - CINAHL, PubMed, & MEDLINE databases
  - Search terms included *adherence*, *vitamin D deficiency*, & *breastfeeding*
  - Search limits included full text, peer-reviewed articles, English language, infant & newborn population, & published between 2003 & 2021
  - Search results included one CINAHL, 17 PubMed, & seven MEDLINE articles
- Second evidence search was conducted using Vanderbilt University's online Jean and Alexander Heard Library Catalog & Google Scholar
  - Search terms included *adherence*, *guideline*, *order sets*, & *pediatrics*
  - Search results included 863 Vanderbilt University & 1,640 Google Scholar articles
  - After adjusting for search limits, 174 Vanderbilt University results were found

Synthesis of the Evidence

- 10 articles & three meeting abstracts included for review
- All but two articles (Bell et al., 2010; Forrest et al., 2013) were descriptive studies
  - Five implementation studies (Coleman et al., 2012; Dayal & Alvarez, 2015; McCulloh et al., 2021; Studer et al., 2020; Watnick et al., 2015)
  - Two observational studies (Taylor et al., 2009; Uday et al., 2017)
  - One qualitative study (Kaiser et al., 2020)

Synthesis of the Evidence

- Clinical decision support (CDS) tools
  - Use of electronic order sets to implement evidence-based guidelines to improve adherence & clinical outcomes
- Provider education
  - Used to improve provider awareness of evidence-based guidelines
- Meeting abstract findings
  - Published by AAP
  - Aimed to improve vitamin D guideline adherence rates

Synthesis of the Evidence

- Evidence supports use of standardized electronic order sets as effective measure:
  - increasing provider adherence to clinical practice guidelines
  - improving care practices & outcomes
- Standardized electronic order sets offer clinical decision support for providers
  - Streamline provider workflows
  - Ensure *"the right care, the first time, every time"* (Runnacles et al., 2018, p. 32)
- Weaknesses & gaps
  - Barriers to guideline adherence
  - Low quality evidence in support of CDS tools to improve provider adherence to AAP vitamin D supplementation guidelines

Methods

- Project Design
  - Quality improvement (QI)
  - Model for Improvement (MFI)
  - Plan-Do-Study-Act (PDSA) cycles
- Setting
  - Norton Women's and Children's Hospital & Norton Hospital newborn nurseries
  - Newborns admitted to newborn nursery under care & supervision of Norton Children's Neonatology Newborn Team
  - Approximately 40-50 newborns per day
- Participants
  - Newborn Team providers
  - Five advanced practice registered nurses (APRNs), one medical doctor (MD), & one physician assistant (PA)

Methods

- **Plan for Implementation**
- Plan
  - Stakeholder buy-in
  - Written & verbal communication & education c/w current AAP vitamin D supplementation guideline recommendations for providers, parents, & families
  - Verbal communication & education for dosing & safe administration of vitamin D supplement
  - Standardized electronic order set for prescribing vitamin D supplement (i.e., 400 IU daily) at time of discharge
  - IRB approval
- Do
  - Planned changes to be implemented over two weeks

Methods

- Study
  - Post-implementation analyses for improved provider adherence to AAP vitamin D supplementation guidelines
  - Descriptive statistics
  - Barriers to implementation identified by post-implementation focus group for Newborn Team providers
- Act
  - Decision to adopt, adapt, or abandon project initiatives

Data Collection

- Awareness
  - Provider Awareness Questionnaire
  - “aware” or “not aware”
- Agreement
  - Provider Agreement & Adoption Questionnaire
  - “agree” or “disagree”
- Adoption
  - Provider Agreement & Adoption Questionnaire
  - “yes” or “no”
  - Begins implementation phase
  - “adopters” or “non-adopters”

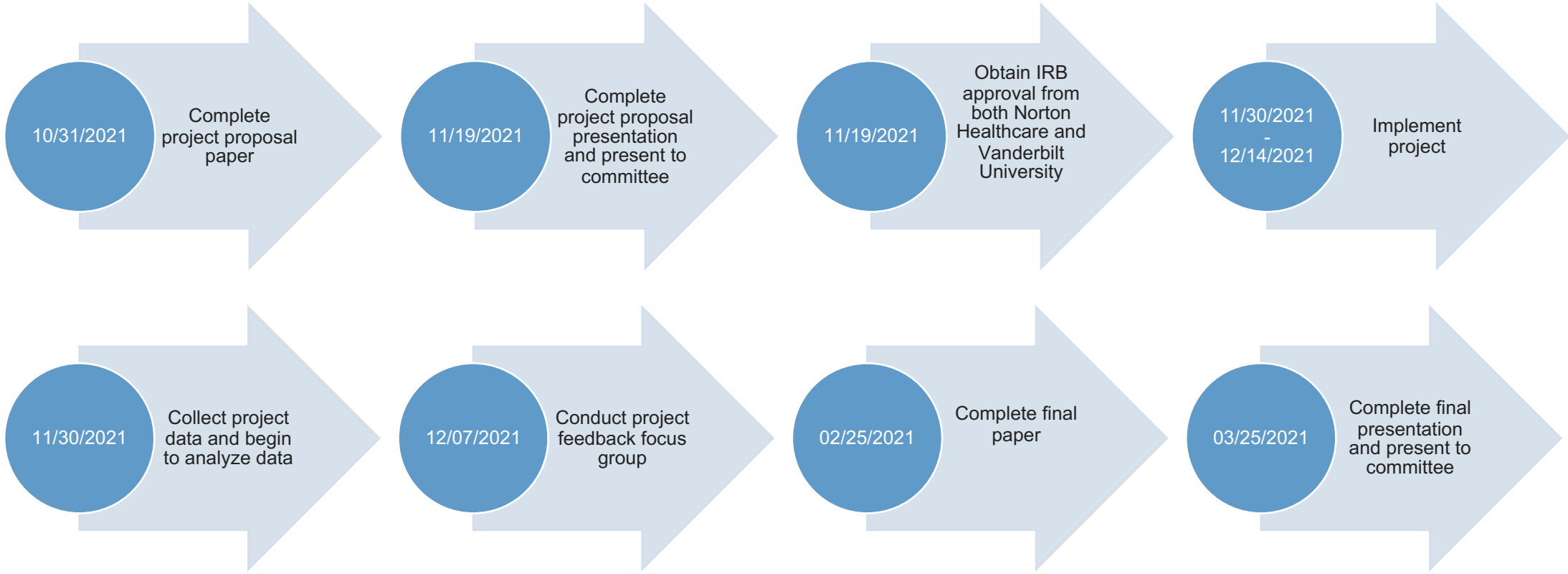
Data Collection

- Adherence
  - Provider adherence rates will be assessed via chart review & compared to pre-implementation rates (i.e., zero) & goal adherence rates (i.e., >/= 90%)

Analysis

- Descriptive statistics
  - Pre- & post-implementation adherence percentages
  - Categorial variables: “Adherers” vs “Non-adherers”
    - Frequency distribution tables
    - Raw counts and percentages
  - Continuous variables: Overall provider adherence rates
    - Central tendency (mean, median, mode)
    - Variability (range, interquartile range, standard deviation)
- Sample characteristics
  - Exclusively vs partially breastfed newborns, gender, race, gestational age at birth, birth weight, insurance coverage

Timeline of Project

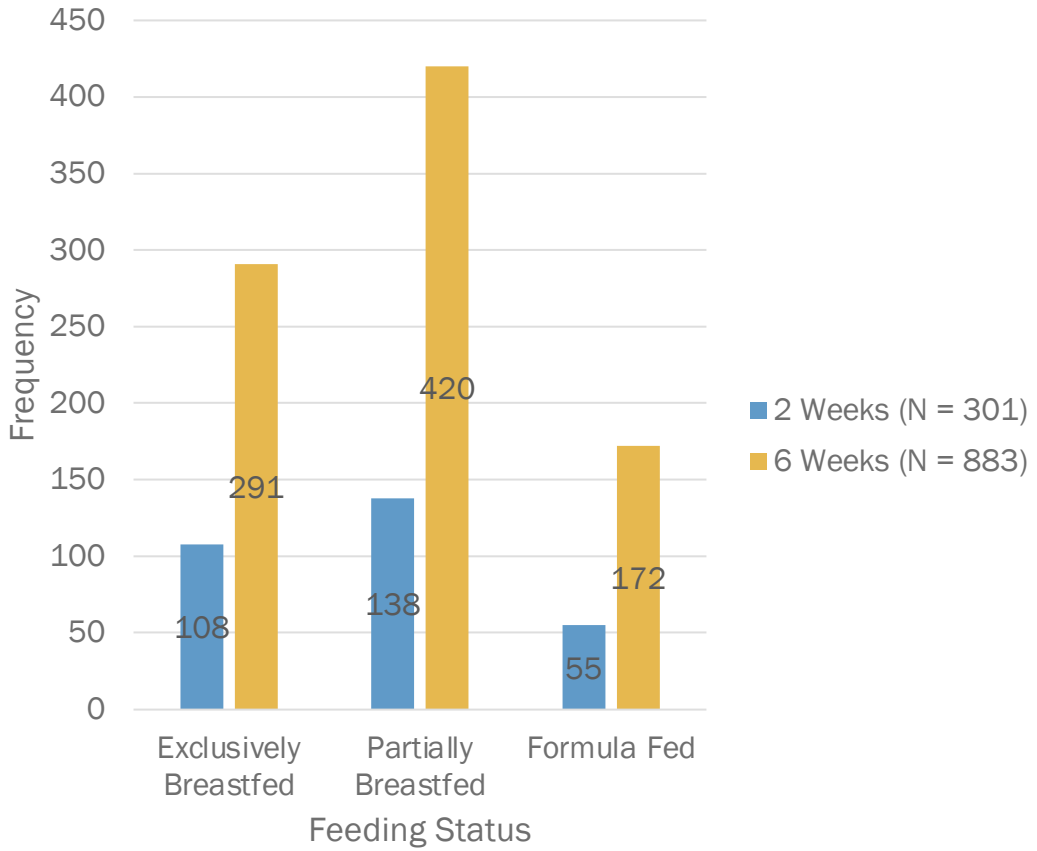


Budget

Cost	Benefit	Projected	Actual
Amount of time spent placing vitamin D prescription orders	Vitamin D prescribed prior to discharge	< 1 minute	TBD
Amount of time spent brining vitamin D prescriptions to patient rooms	Meds-to-Beds program allows for easy access to prescriptions	< 1 hour	TBD
Amount of time spent waiting for vitamin D prescriptions	Vitamin D prescription received prior to discharge	< 1 hour	TBD
Vitamin D prescriptions	Low cost if not covered by insurance	< $10.00	TBD
Pharmacy supply of vitamin D	Supply already established	No additional costs	TBD
Additional pharmacy staff & resource utilization	Increase in vested interests & potential for revenue	No additional costs	TBD

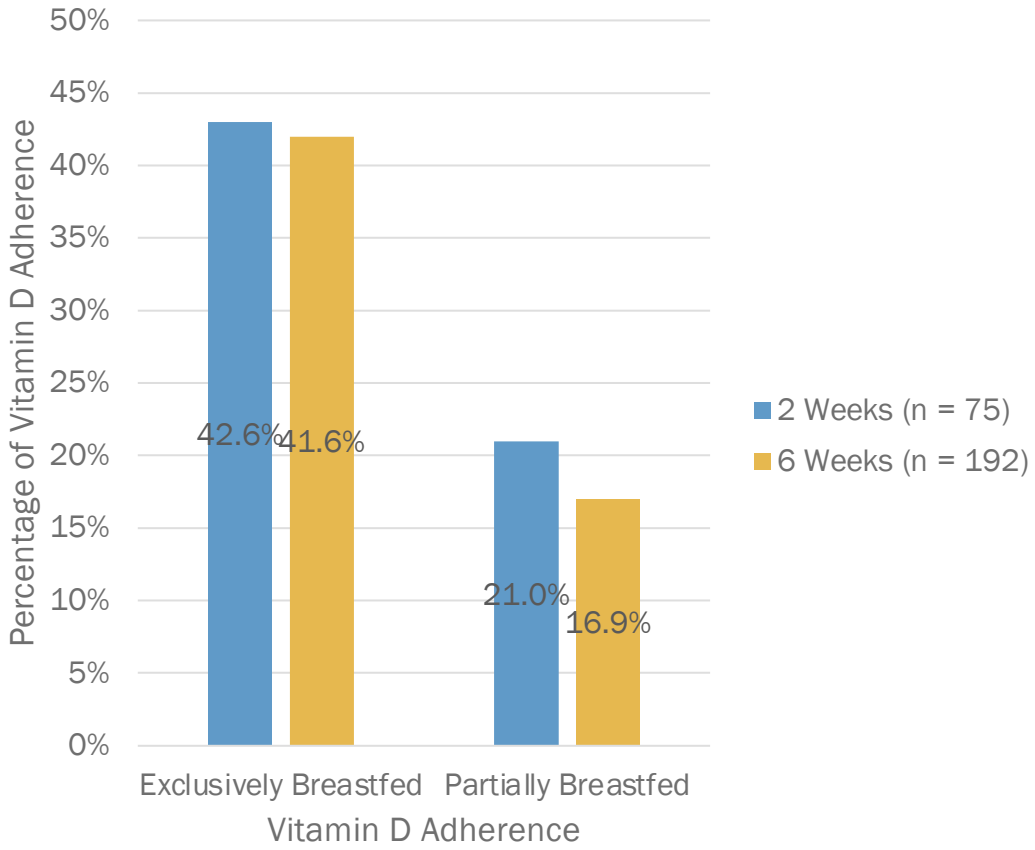
Results

- **N = 301** (1/17/22 – 1/31/22)
- **N = 883** (1/17/22 – 2/28/22)
- Newborn feeding status:
  - ***Exclusively breastfed*** (n = 108; n = 291)
  - ***Partially breastfed*** (n = 138; n = 420)
  - ***Formula fed*** (n = 55; n = 172)



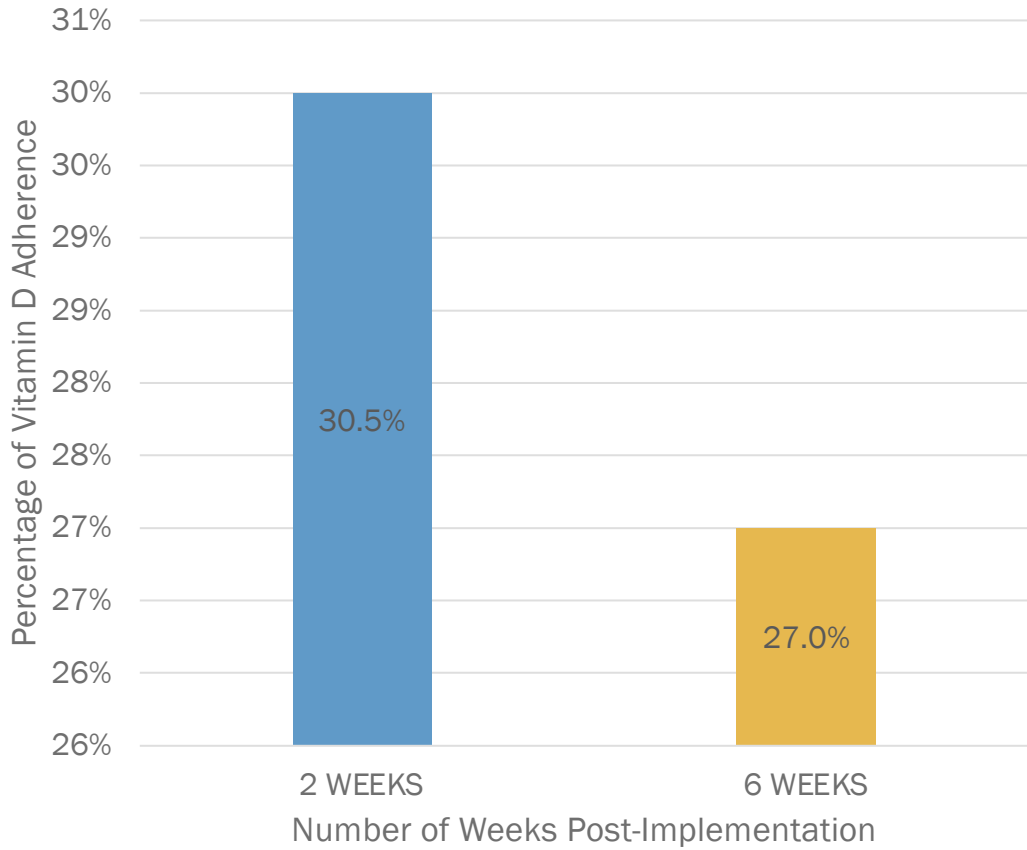
Results

- **Exclusively breastfed newborns:**
  - Vitamin D prescribed at discharge 61.3% (n = 46); 63.0% (n = 121)
  - Adherence to guideline recommendations **42.6%** (n = 46); **41.6%** (n = 121)
- **Partially breastfed newborns:**
  - Vitamin D prescribed at discharge 38.7% (n = 29); 37.0% (n = 71)
  - Adherence to guideline recommendations **21.0%** (n = 29); **16.9%** (n = 71)

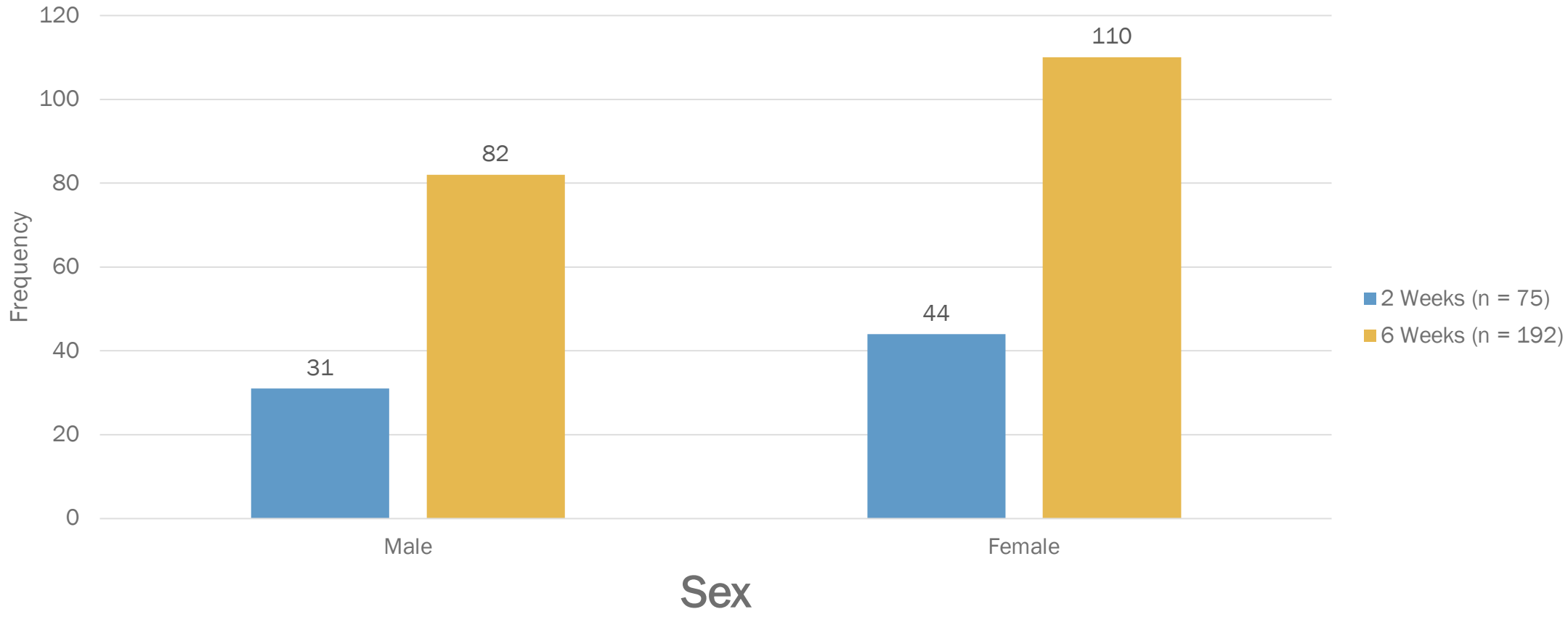


Results

- Provider adherence to guideline recommendations for breastfed newborns **30.5%** (n = 75); **27.0%** (n = 192)



Demographics



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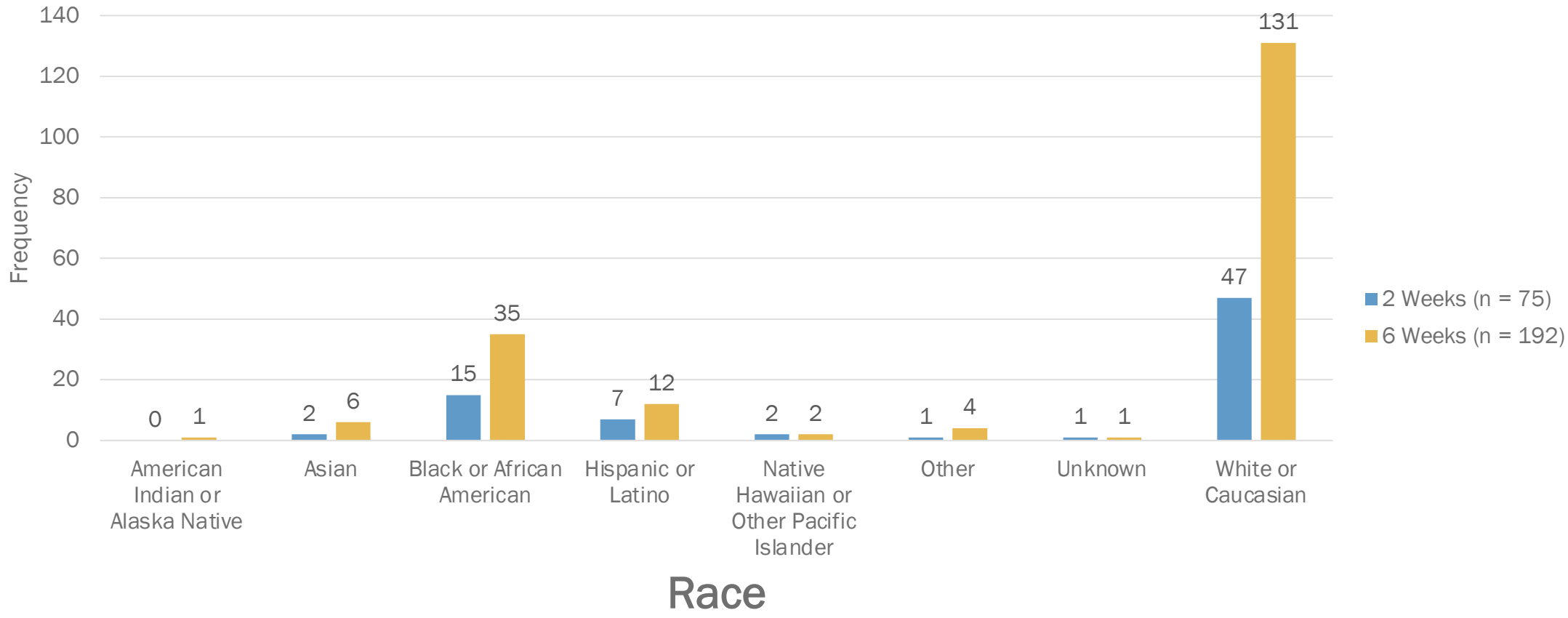

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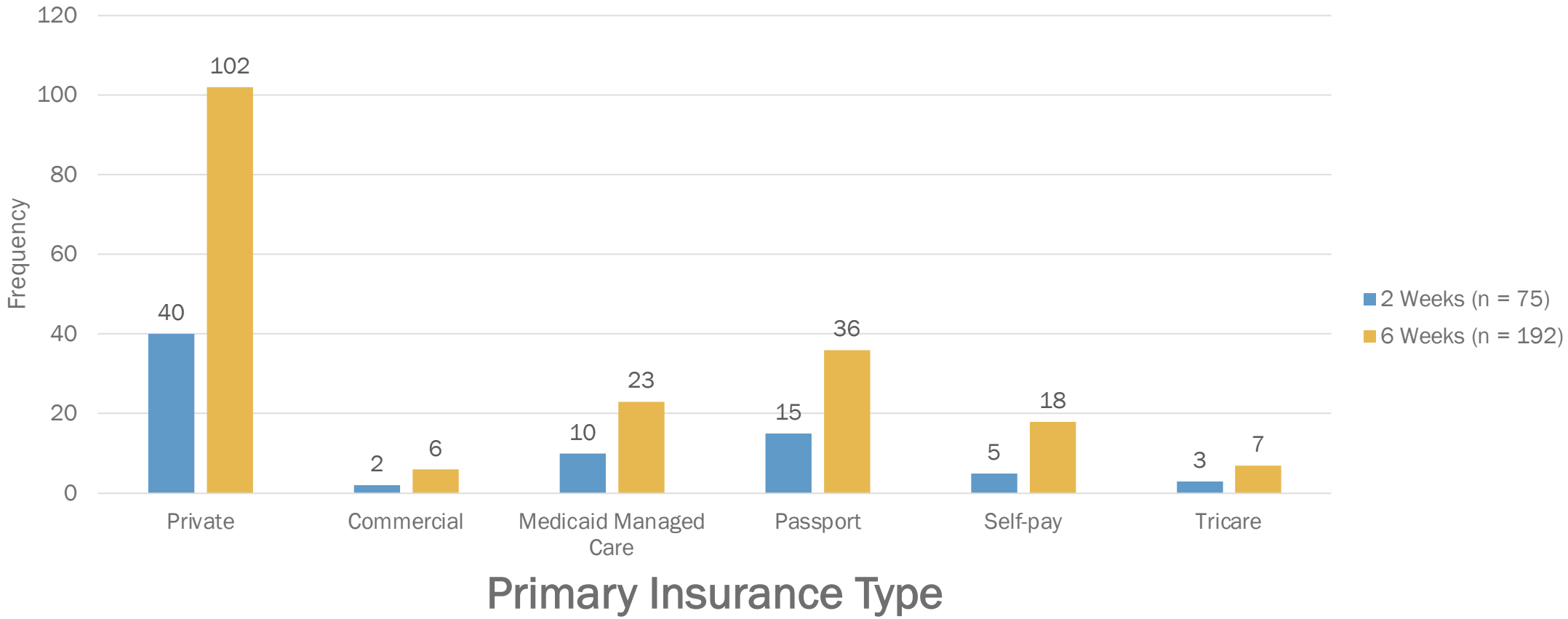

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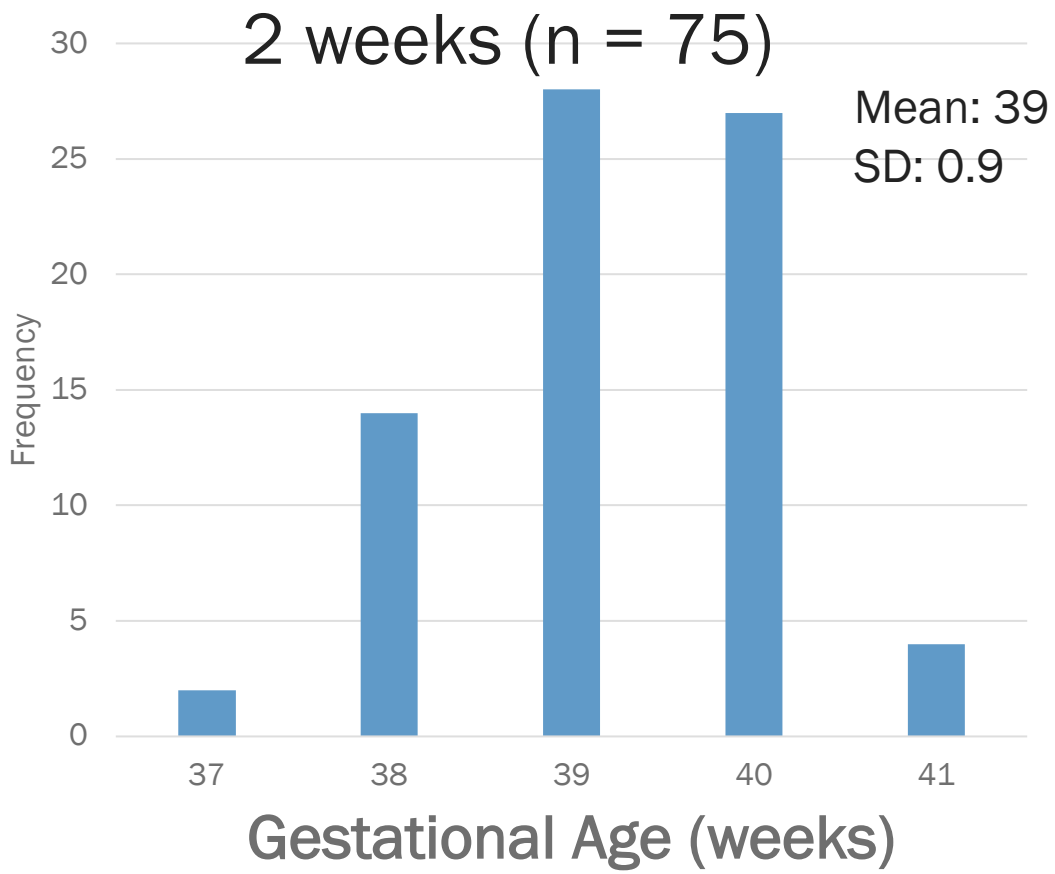

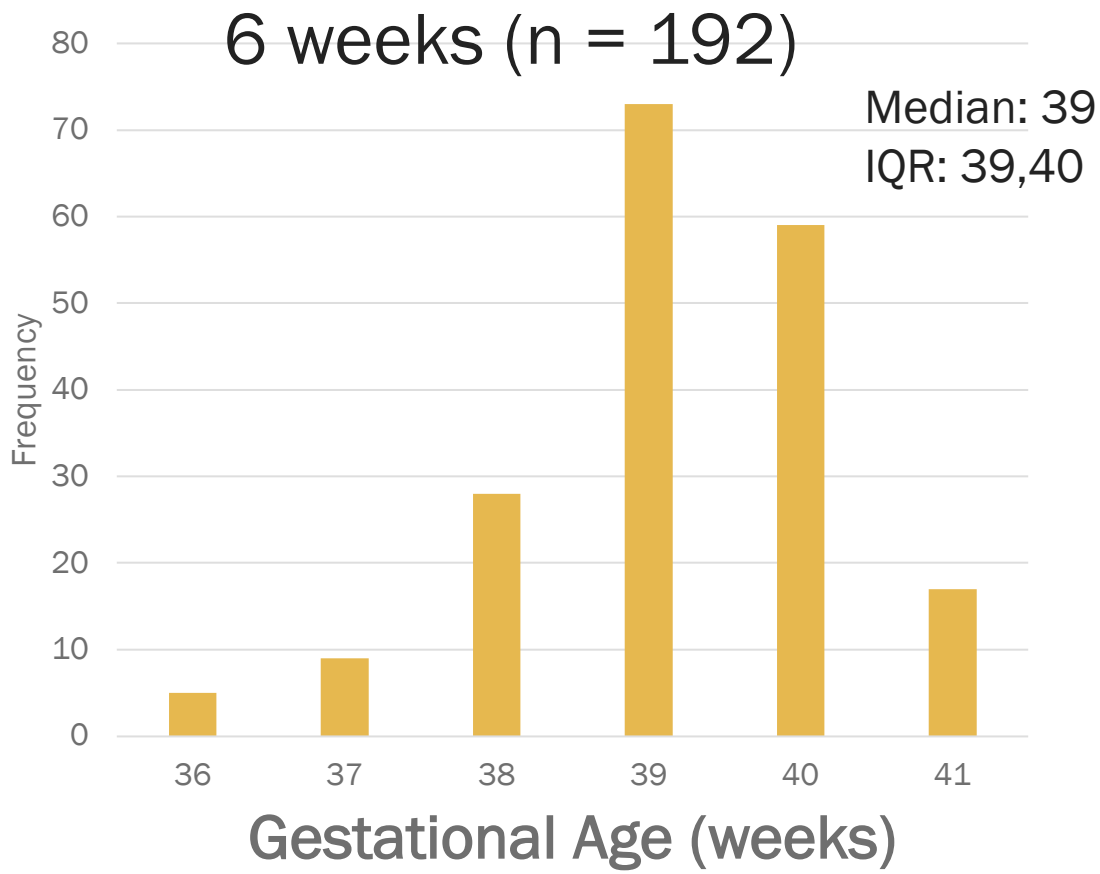

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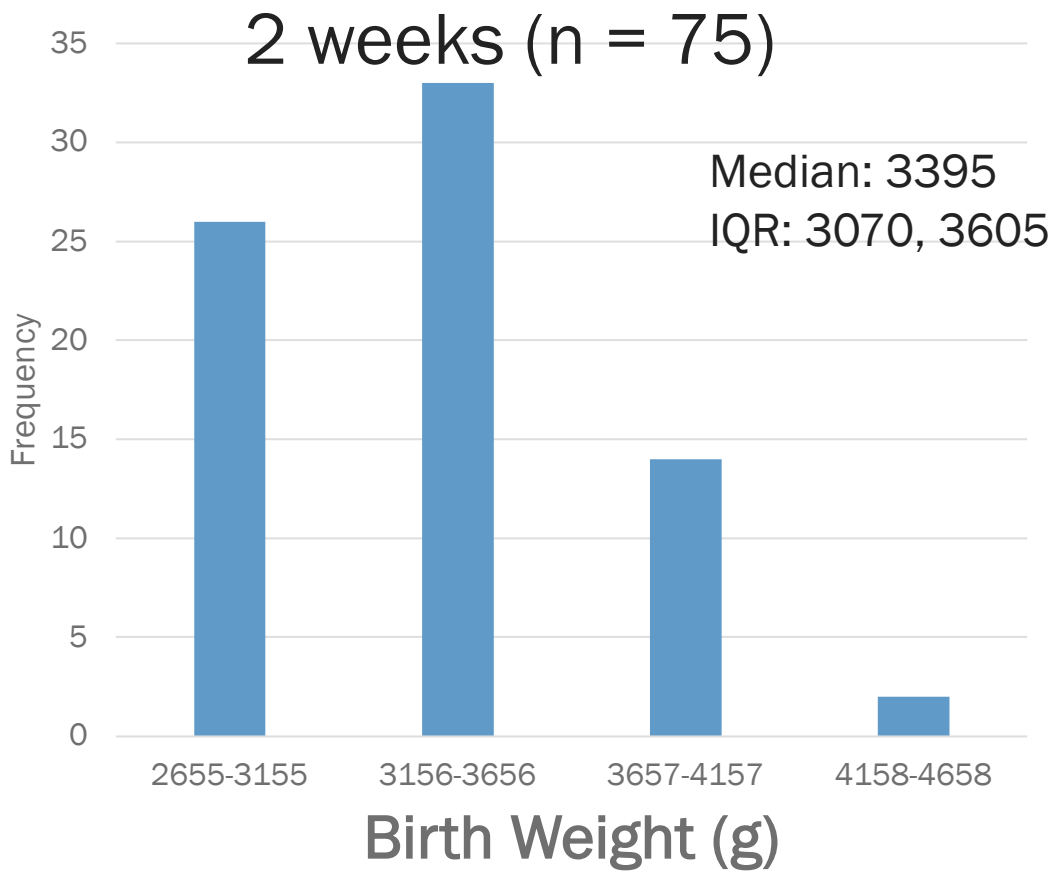

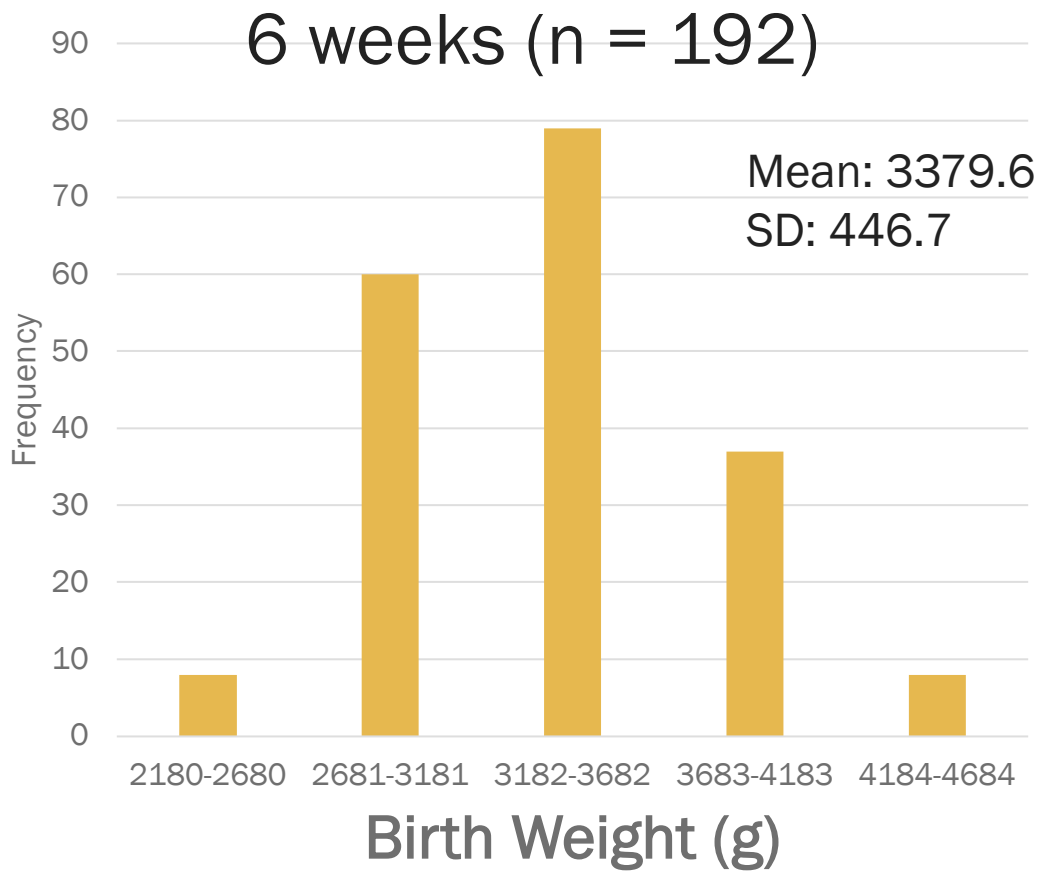

Implications for Practice

- Project findings consistent with similar study findings (Watnick et al., 2015)
- Barriers to implementation included a lack of awareness or agreement with guideline recommendations
- Awareness-to-Adherence model (Pathman et al., 1996)

Conclusion

- Goal 90% not achieved, but provider adherence did improve post-intervention (i.e., from zero to 27.0%)
- Suggests electronic order sets effective in improving provider adherence to evidence-based practice guidelines
- Project initiatives adopted and plans for increased provider education
- Future QI project aims:
  - Continued improvements in Newborn Team provider adherence
  - Expanded provider adherence
  - Vitamin D supplement adherence at follow-up appointments

Questions

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