

Creighton UNIVERSITY
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Development and Implementation of Pain Relief Guidelines for the NICU

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Learning Objectives

- Discuss significance of neonatal pain assessment and management
- Review available literature related to pain assessment, management, and benefit of written guidelines
- Highlight results from implementation of procedural pain guidelines in the neonatal intensive care unit
- Review strengths, limitations, and sustainability of the guidelines

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Financial Disclosure

- I have no financial interest or conflicts of interest with any material in this presentation

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Background

- Painful procedures necessary for survival
- Can neonates feel pain?
- 50-80% of painful procedures are still performed without analgesia^{3,4}






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Significance

- **Short-term:** decreased oxygen saturation and increased heart rate, elevation in intracranial pressures, depression of the immune system⁵
- **Long-term:** changes in pain thresholds, stress responses, and pain responses to nonpainful stimuli; lower cognitive and motor scores; impairments in growth; reduced white matter and subcortical gray matter maturation⁶
- Accurate pain assessment & prompt management in neonates (NANN & AAP)

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Local Problem

- State of Nebraska preterm birth rate = 11.1%⁷
- US preterm birth rate = 10.4%
- Procedures still performed without analgesia
- No written pain relief guidelines
- N-PASS scores not discussed in daily rounds or documented in provider daily notes



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Clinical Problem Statement

Neonates in the NICU routinely undergo painful procedures that are necessary for their survival but are not without pain, which if not recognized and managed promptly and effectively, can lead to both short-term and long-term adverse complications

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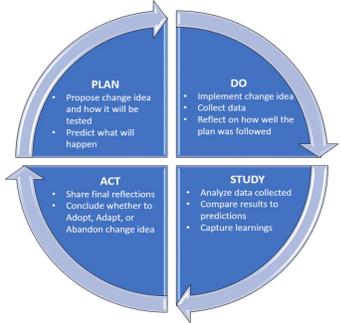
Review of the Literature

- Neonatal Pain Assessment
 - Reliable & validated pain assessment tool = N-PASS
- Pain Management Interventions
 - Nonpharmacologic vs Pharmacologic
- Impact of Pain Relief Guidelines



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PDSA Model



PLAN

- Propose change idea and how it will be tested
- Predict what will happen

DO

- Implement change idea
- Collect data
- Reflect on how well the plan was followed

STUDY

- Analyze data collected
- Compare results to predictions
- Capture learnings

ACT

- Share final reflections
- Conclude whether to Adopt, Adapt, or Abandon change idea

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Purpose

The purpose of this evidence-based quality improvement project was the development and implementation of procedural pain relief guidelines to provide safe and effective neonatal pain management

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Aims

1. To develop & implement standardized guidelines for procedural pain management in neonates admitted to the NICU.
2. To educate bedside staff on proper assessment of pain using the N-PASS pain scale.
3. To educate bedside staff and providers (MD/NNP) on nonpharmacologic and pharmacologic pain management interventions.
4. To increase discussion of N-PASS scores and pain management plan in daily rounds.
5. To increase provider (MD/NNP) documentation of N-PASS scores and pain management plan in daily progress notes.
6. To create an EPIC dot phrase for consistent pain documentation in provider daily progress notes.

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Methods

- Design: QI project
 - Team Formation (NNP, NICU Pharmacist)
 - 2 Guidelines:
 - Procedural Pain Guideline for Mild to Moderately Painful Procedures
 - Procedural Pain Guideline for Moderate to Severely Painful Procedures
 - EPIC dot phrase
 - Education
 - N-PASS Data Collection Tool
 - Infant Data Collection Tool

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N-PASS: Neonatal Pain, Agitation, & Sedation Scale

Pat Hummel, MA, RNC, NNP, PNP, APN/CNP

Assessment Criteria	Sedation -2	Sedation/Pain -1	Sedation/Pain 0/0	Pain / Agitation 1	Pain / Agitation 2
Crying Irritability	No cry with painful stimuli	Moo or cry minimally with painful stimuli	No sedation/ No pain signs	Irritable or crying at intervals	High pitched or sustained continuous cry
Behavior State	No arousal to any stimuli	Arouse minimally to stimuli	No sedation/ No pain signs	Awake, squinting	Awake, looking consistently awake or Arouse minimally / no movement (not sedated)
Facial Expression	Mouth is lax	Minimal expression with stimuli	No sedation/ No pain signs	Any pain expression intermittent	Any pain expression continual
Extremities Tone	No grasp reflex	Weak grasp reflex	No sedation/ No pain signs	Intermittent clenched fist, fist or finger splay	Continual clenched fist, fist or finger splay
Vital Signs HR, SpO₂, BP, SaO₂	No variability with stimuli	± 10% variability from baseline with stimuli	No sedation/ No pain signs	± 30-20% from baseline SaO ₂ > 95% with stimulation - quick recovery	± 30% from baseline SaO ₂ < 75% with stimulation - slow recovery Out of sync with vent

Loyola University Health System, Loyola University Chicago 2009
Rev. 2/2019 Pat Hummel, MA, RNC, NNP, PNP

Procedure Pain Assessment → -1 if < 30 weeks gestation / corrected age

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Procedural Pain Relief Guidelines for Mild to Moderately Painful Procedures

Intervention	Procedures	Special Considerations
Facilitated Tucking/Swaddling	<ul style="list-style-type: none"> Heel Stick PIV Venipuncture Arterial Stick Lumbar Puncture 	The combination of these interventions is more effective than any of these interventions alone
Non-Nutritive Sucking	<ul style="list-style-type: none"> Wound Cares Circumcision Intramuscular Injections Feeding Tube Insertion Urinary Catheterization ROP Eye Examinations PICC placement 	Oral Sucrose: <ul style="list-style-type: none"> Use for pain management only Throw away after procedure; do not leave in bed Do not exceed 10 doses in a 24-hour period Most effective when given 2 minutes prior to procedure
Skin to Skin Contact		
0.1 mL of 24% Oral Sucrose Solution		

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Procedural Pain Relief Guidelines for Moderate to Severely Painful Procedures

Drug	Dosing	Procedures	Special Considerations
Fentanyl	<p>Intermittent doses:</p> <ul style="list-style-type: none"> IV: 0.5 to 1 mcg/kg/dose every 2 to 4 hours IV (infused): 0.5 to 3 mcg/kg/dose every 2 to 4 hours Endotracheal: 1 to 4 mcg/kg/dose 	<ul style="list-style-type: none"> Lumbar Puncture Endotracheal Intubation PICC Chest Tube Insertion & Intubating 	<p>Adverse Effects:</p> <ul style="list-style-type: none"> Respiratory depression Chest wall rigidity Tolerance & Dependence Urinary Retention
Morphine	<p>Intermittent doses:</p> <ul style="list-style-type: none"> IV: 0.05 to 0.1 mg/kg/dose every 4 to 8 hours Oral: 0.05 to 0.1 mg/kg/dose every 4 to 8 hours 	<ul style="list-style-type: none"> Lumbar Puncture Endotracheal Intubation (when fentanyl not an option) PICC Chest Tube Insertion & Intubating Wound Cares 	<p>Adverse Effects:</p> <ul style="list-style-type: none"> Respiratory Depression Hypotension Bradycardia Transient Hypertonia Ileus Delayed Gastric Emptying Urinary Retention Tolerance & Dependence Seizures
Acetaminophen	<p>Oral:</p> <ul style="list-style-type: none"> 10 to 15 mg/kg/dose every 6 hours PRN <p>IV:</p> <ul style="list-style-type: none"> PHA 28-31 weeks: 7.5 mg/kg/dose every 8 hours max, daily dose = 40 mg/kg/day 	<ul style="list-style-type: none"> Inwelling Chest Tube Post Circumcision Post Hernia Repair Wound Cares 	<p>Adverse Effects:</p> <ul style="list-style-type: none"> Liver Toxicity Rash Fever Thrombocytopenia Leukopenia Neutropenia

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Setting

- Midwestern NICU
 - Level III, non-surgical, 25-bed NICU
 - Deliveries = 3,145 (2024)
 - Admissions = 506 to NICU (2024)



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Participants

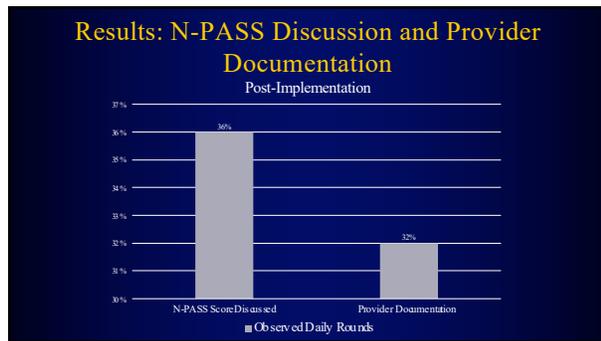
- All neonates admitted to the NICU were eligible to participate
- Exclusion Procedures:
 - Performed in delivery room
 - Emergent
 - By transport team during transport

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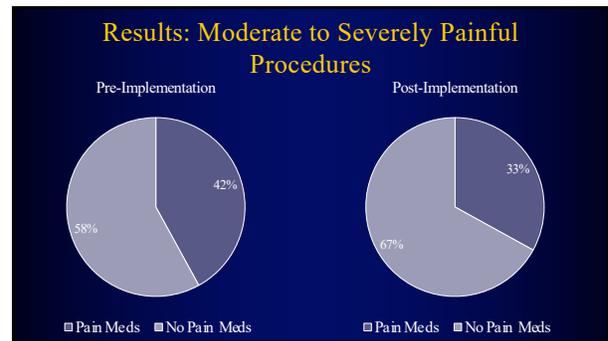
Data Collection & Analysis

- Real-time data collection & retrospective chart review
- Pre- & post-implementation data were compared

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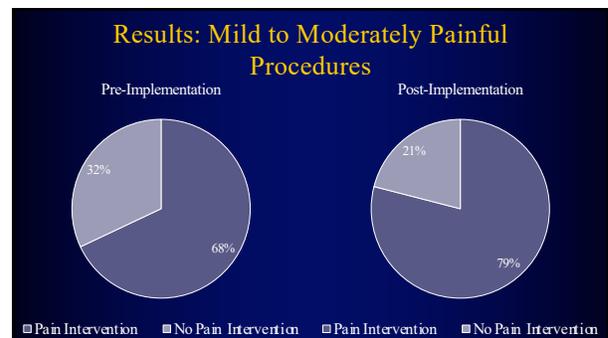
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Results: Frequency of Pain Medication by Procedure Type

Procedure Type	Pre-Implementation (N=38)	Post-Implementation (N=21)
PICC	8 (62%)	5 (42%)
Intubation	3 (17%)	0
Chest Tube	4 (100%) ¹	—
Lumbar Puncture	1 (33%)	2 (40%)
Circumcision ²	—	4 (11%)

¹No patients had PRN pain medication ordered with indwelling chest tube
²PRN pain medication ordered post-circumcision

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Results: Frequency of Pain Management Intervention

Intervention	Pre-Implementation (N=92)	Post-Implementation (N=88)
Facilitated tuck/Swaddling	81 (88%)	82 (93%)
Non-Nutritive Sucking	68 (74%)	71 (81%)
Oral Sucrose ¹	40 (63%)	51 (76%)
Skin-to-Skin	0	0

¹Per oral sucrose policy, 63 pre-implementation infants and 67 post-implementation infants were eligible for oral sucrose

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Discussion

Procedural Pain Guidelines:

1. Do not increase pharmacologic pain interventions in moderate to severe procedures
2. Increase nonpharmacologic pain interventions in mild to moderate procedures

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Strengths, Limitations, Sustainability

Strengths: excitement about the project, provider autonomy

Limitations: one NICU, low use of EPIC dot phrase, lack of IV access, guidelines vs protocol

Sustainability: perceived barriers and hesitation regarding pain management, alternative medication routes, creation of EPIC order sets

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DNP Implications

- **Scholarship:** Uses research to guide practice
- **Leadership:** Multi-disciplinary collaboration
- **Advocacy:** Advocates for those unable to advocate for themselves

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Questions

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