Special Care for Special Babies

Micropreemie Guidelines/Protocols/ Dedicated Units

Neo CQI Workshop
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Some slides courtesy of Dan Ellsbury
Disclosures

Dr. Ursprung has disclosed the following relevant financial relationships. Any real or apparent conflicts of interest related to the content of this presentation have been resolved.

**Affiliation / Financial Interest**  
**Organization**

Employee: Mednax Neonatologist

Associate Director CQI: Neonatology

Member Vermont Oxford Network: Database Advisory Committee

**Unapproved or Off Label Disclosures:**

This presentation will **NOT** involve discussion of unapproved or off-label, experimental or investigational use of a product, drug or device.
Early Experiments in transportation
Assumptions

• We all want the best clinical outcome

• Virtually all providers “work hard” to achieve the above

• Improvement is possible
  – But you must know the truth (via robust data)
  – And you must apply robust QI methodology

• Context Matters
Key Principles for Small Baby Units

• Babies/families **deserve** a consistent, unified approach across the spectrum of care

• There is little “iron clad” data to guide care, thus much of this is controversial

• If you are going treat these babies, then treat these babies!

• Don’t wing it…create a plan, follow it & **learn from it!**
Key Principles

- In general...
  - Clinician driven variation: **NOT** good for patient outcomes
  - Patient driven variation: **GOOD** for patient outcomes
Key Elements of Micropreemie Care

- Family Engagement & Support
- Perinatal
- DR/ Golden Hour/ Thermoregulation
- Skin care
- Nutrition/ Fluid management
- Respiratory
- Cardiovascular Support/ Approach to the PDA
- Developmental Care
- Staffing Models
Micropreemie Care

- Newborns are already cohorted to varying degrees
  - Cardiac
  - Surgical
  - Medical
  - Neuro
Micropreemie Care

• We think about VLBWs as a unique population

• Clearly 500g infants are quite different from 1400g infants
Micropreemies

- What guidelines/protocols do you have in place for micropreemies?
- What about a dedicated team?
- What about a dedicated physical space?
Intubation with 2.5 ETT
Curosurf in DR
after digital CXR if
HR>100 & available

Transport in isolette to
NICU on SIMV:
rate 40, PIP 18-25,
PEEP5

Admission Jet Settings
Rate: 420
PIP: 20-24
PEEP: >=7

Response to HypOcarbia

<45-40, DECREASE JET PIP BY 1-2
39-35, DECREASE JET PIP BY 2-3
<35, DECREASE JET PIP BY 3-4

ABGs q3h x 1st 1: 2 hr, then
q4-6hr till stable, then
Minimum q12h till 7 DOL

Response to Hypercarbia

IF WELL RECRUITED WITH APPROPRIATE PEEP (=>7)
60-64, INCREASE JET PIP BY 1-2
65-69, INCREASE JET PIP BY 3-4
>70, INCREASE JET PIP BY 5-6

*JET BACK UP RATE SHOULD BE USED ONLY TRANSIENTLY
(HOURS) & STOPPED WHEN ATELECTASIS RESOLVED

Caffeine Dosing & duration
10mg/kg/day on admission
Increase to 20mg/kg/day at 7 days of life or 24 hours prior to
first extubation if <7 days
Adjust for growth until >=32 weeks
Consider stopping @34-37 weeks if
off PPV & >5 days without apnea

Target pCO2
FIRST 72H:
45-55
THEN: 45-65

Extubation criteria
>=25 weeks
FiO2 <60%
PIP <21
pCO2 <55

Consider rate to 300
at first sign of PIE

Mean Arterial Pressure Goal >

Courtesy Erin Spence, MD, Baylor Scott & White All Saints Med Center
FEN guideline for 22-24 wk GA

**Admission Fluids**

**UV1:** D5W + 3% trophamine + 1meq/100ml CaGluconate + 0.25units/ml Heparin @ 120ml/k/d

**UV2:** sterile water + 3% trophamine + 0.25units/ml Heparin @ 0.3ml/hr

**UAC:** sterile water + 8mEq/100ml NaAcetate +0.25units/ml Heparin @ 0.3-0.5ml/hr

**Target values**

- **SODIUM:** 135-148
- **GLUCOSE:** 80-220

**LAB FREQUENCY & DURATION**

- Lytes Q6 hr till stable x 24-48hr; iStat if able
- Chemstrips q1h x 3, then q3-6 hr x 72 hr then space out towards Q12hr if stable.

- Check TSH & free T4 at 1 month

**HYPERnatremia**

- 145-150
  - D5W @ 20ml/k/d (GIR 0.7)

- 151-155
  - D5W @ 40ml/k/d (GIR 1.4)

- >155
  - D5W @ 60ml/k/d (GIR 2)

OK to use sterile water gavage

RN to call if UOP >5ml/k/h q shift

**HYPOnatremia**

- Sodium <135
  - *Consider adrenal insuff UOP <2ml/k/h*

- Decrease TF by 20-40ml/k/d

- *Decrease humidity by 10%

Prenatal Consult by Neo within 2 hours using visual aids, consult template, & specific plan

Prenatal Consult by Neo within 2 hours using visual aids, consult template, & specific plan

Courtesy Erin Spence, MD, Baylor Scott & White All Saints Med Center
Implementation of a multidisciplinary guideline-driven approach to the care of the extremely premature infant improved hospital outcomes

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Guideline focused on...

– Introduction
– Resp
– Skin
– Development
– CV
– PDA
– Fluids/Nutrition
– Neurological/Sedation
– Labs
– Infection Control
– Family

## Patient Characteristics

<table>
<thead>
<tr>
<th></th>
<th>Comparison (n = 40)</th>
<th>SBG (n = 37)</th>
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</thead>
<tbody>
<tr>
<td>Birthweight (g)</td>
<td>718 ± 141</td>
<td>705 ± 170</td>
</tr>
<tr>
<td>Gestational age (weeks)</td>
<td>25.0 ± 1.2</td>
<td>24.9 ± 1.2</td>
</tr>
<tr>
<td>Age on admission (days)</td>
<td>2.0 ± 2.1</td>
<td>2.1 ± 2.1</td>
</tr>
</tbody>
</table>
## Survival

<table>
<thead>
<tr>
<th></th>
<th>Comparison</th>
<th>Small baby</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number</td>
<td>40</td>
<td>37</td>
<td>--</td>
</tr>
<tr>
<td>Survived 1st week</td>
<td>33 (83%)</td>
<td>36 (97%)</td>
<td>0.017</td>
</tr>
<tr>
<td>Survived to 28 days</td>
<td>30 (75%)</td>
<td>30 (81%)</td>
<td>0.26</td>
</tr>
<tr>
<td>Survived to discharge</td>
<td>28 (70%)</td>
<td>27 (73%)</td>
<td>0.39</td>
</tr>
</tbody>
</table>

## Combined Outcome in Survivors

<table>
<thead>
<tr>
<th></th>
<th>Comparison</th>
<th>Small baby</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Survived without BPD</td>
<td>3/35 (9%)</td>
<td>9/37 (24%)</td>
<td>0.037</td>
</tr>
<tr>
<td>Survived without severe IVH</td>
<td>15/40 (38%)</td>
<td>24/37 (65%)</td>
<td>0.008</td>
</tr>
<tr>
<td>Survived without BPD or</td>
<td>2/35 (6%)</td>
<td>10/37 (27%)</td>
<td>0.008</td>
</tr>
<tr>
<td>severe IVH</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Number/group size (percent).

Small Baby Unit Improves Quality and Outcomes in Extremely Low Birth Weight Infants

Mindy Morris, DNP, John Patrick Cleary, MD, Antoine Soliman, MD
CHOC Children’s

• <=28 wk GA & 1000g or less

<table>
<thead>
<tr>
<th>Pre</th>
<th>Post</th>
</tr>
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<tbody>
<tr>
<td>Mean GA</td>
<td>25.6</td>
</tr>
<tr>
<td>Mean BW</td>
<td>772g</td>
</tr>
<tr>
<td>Inborn</td>
<td>29%</td>
</tr>
<tr>
<td>Outcome Measure</td>
<td>Preintervention, %</td>
</tr>
<tr>
<td>-----------------------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>CLD</td>
<td>47.5</td>
</tr>
<tr>
<td>Home on oxygen</td>
<td>23.0</td>
</tr>
<tr>
<td>Successful extubation first wk</td>
<td>47.5</td>
</tr>
<tr>
<td>CPAP alone (^b)</td>
<td>3.8</td>
</tr>
<tr>
<td>Nosocomial infection (^c)</td>
<td>39.3</td>
</tr>
<tr>
<td>Growth restriction</td>
<td>62.3</td>
</tr>
</tbody>
</table>

\(^a\) P value based on \(\chi^2\) test statistic.

\(^b\) CPAP alone results are for inborn patients, preintervention \(n = 26\), postintervention \(n = 93\).

\(^c\) Late-onset sepsis results include all SBU admissions.
## Resource Utilization

<table>
<thead>
<tr>
<th></th>
<th>Pre ((n=61))</th>
<th>Post ((n=161))</th>
<th>(p)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labs (mean)</td>
<td>224</td>
<td>82</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>X-Rays (mean)</td>
<td>45</td>
<td>22</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>
Micropreemie Care

• What guidelines/protocols do you have in place for micropreemies?

• What about a dedicated team/physical space?
  – What potential good things that might occur?
  – What potential bad things that might occur?

• If you wanted to move in this direction…
  – Where would you start?
  – What would be key obstacles/challenges?
OB Management

• If you are going to treat these babies, then treat them....

• If planning to resuscitate...
  – Antenatal steroids are one of the most powerful tools we have to improve outcome
  – Reduction in mortality, IVH, NEC, improved neurodevelopmental outcome
  – Start ~2 days before “earliest” resus day

• C/S is controversial
Delivery Room

- Delayed cord clamping (or cord stripping/milking)

- Avoid Hypo/Hyperthermia
  - Optimize room temperature
  - Plastic wrap
  - Thermal mattress
  - Optimal use of radiant warmer
  - Dedicated “resuscitation room”
Delivery Room

- Avoid volutrauma/atelectotrauma
  - ?? T Piece resuscitator ??

- Approach to resp support
  - Nasal CPAP vs
  - Prophylactic surfactant (in DR vs NICU) vs
  - INSURE

- Conventional vs High frequency ventilation

- High level team functioning

- Most experienced person do the resus
What can you do to prevent severe intraventricular hemorrhage?
IVH Prevention

- **Indomethacin IVH prophylaxis**
  - Less any or severe IVH
  - Less pulmonary hemorrhage, PDA, PDA ligation
  - Has not improved long term outcomes

- **Avoid hemodynamic instability**
  - Delayed cord clamping, minimize phlebotomy

- **What else could you consider:**
What can you do to prevent necrotizing enterocolitis?
NEC Prevention

• NEC window: Birth >> ~33 weeks CGA
  – Risk peaks ~30-32 weeks CGA

• **Early feeding**
  • Exclusive human milk
  • 1\textsuperscript{st} feeds with colostrum
  • Use a feeding guideline

• Avoid acid blockade

• Probiotics?

• Minimize antibiotic exposure

• Transfusions?

• What else can you do to prevent NEC?
What can you do to prevent late-onset sepsis?
Preventing Late Onset Sepsis

- Central line insertion & maintenance bundles
  - Remove tubes/lines ASAP (when feeds reach XXX mL/kg/day (unless there are special circumstances)

- Human milk

- Hand hygiene

- Antibiotic stewardship

- What else can you do to prevent sepsis?
What can you do to prevent bronchopulmonary dysplasia?
Reducing BPD

• Avoid volutrauma/atelectotrauma
• Optimize CPAP/Minimize vent days
• Optimize oxygen dosing
• Optimize nutrition
• Meds
  – Caffeine
  – Vitamin A??
  – Postnatal steroids when/to whom??
• VAP Prevention
• What else can you do to reduce BPD?
What can you do to prevent retinopathy of prematurity?
Preventing ROP

- Optimal Oxygen dosing
  - Avoid hyperoxia (SpO2 >95% while on supplemental O2 until at least 32 weeks PMA)

- Avoid SpO2 fluctuations
  - Small O2 titrations
  - Avoid O2 for Apneas, poor signal, “prophylaxis”

- Appropriate exams/treatment
- Optimized nutrition/growth
- What else can you do to prevent ROP?
What can you do to prevent mortality?
Preventing Mortality

• Antenatal steroids
• Do all the things to prevent NEC
• Do all the things to prevent late onset sepsis
• Excellent resp care, especially in the 1st week

• What else can you do?
Questions?