First Do No Harm:

*Trauma-Informed, Age-appropriate Care in the NICU*

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Upon completion the participant will be able to:

1. The learner will describe the impact of toxic stress on the developing brain.
2. The learner will list 3 traumatic experiences of the hospitalized infant associated with an NICU stay.
3. The learner will identify 3 evidence-based age-appropriate care strategies that mitigate toxic stress in the NICU.
* Concept of traumatic stress emerged in the field of mental health 4 decades ago
* Trauma is a widespread public health concern and occurs as a result of an emotionally harmful experience
* Individual trauma results from an event, series of events, or set of circumstances that is experienced by an individual as *physically or emotionally harmful or life threatening* and that has lasting adverse effects on the individual’s functioning and mental, physical, social, emotional, or spiritual well-being.
Trauma-Informed Care

Healthcare Providers’ Guide to Traumatic Stress in Ill or Injured Children

...AFTER THE ABCs, CONSIDER THE DEFs

DISTRESS
- Assess and manage pain.
- Ask about fears and worries.
- Consider grief and loss.

EMOTIONAL SUPPORT
- Who and what does the patient need now?
- Barriers to mobilizing existing supports?

FAMILY
- Assess parents’ or siblings’ and others’ distress.
- Gauge family stressors and resources.
- Address other needs (beyond medical).

“...early emotional experiences literally become embedded in the architecture of their brains.” NSCDC 2004
ACE Categories

* **Abuse**
  * Emotional; physical; sexual

* **Household Dysfunction**
  * Mother treated violently; household substance abuse; household mental illness; parental separation or divorce; incarcerated household member

* **Neglect**
  * Emotional; Physical
Mechanisms by which Adverse Childhood Experiences Influence Health and Well-being Throughout the Lifespan
“Preterm birth is an early adverse experience characterized by exposure to high levels of stress and altered buffering effects of maternal care.”

Figure 2. A prospective model to inform preterm behavioral epigenetic studies.
Vulnerability of the Developing Brain

Easily hurt or harmed physically, mentally, or emotionally
Susceptibilities of the Developing Human

The state of being easily affected, influenced, or harmed by something
Critical and Sensitive Periods of Development

CRITICAL/SENSITIVE PERIODS
Neurobiological Mechanisms
- Change in balance of excitation to inhibition
- Involves activity at interneurons
- Increasing preference to selective environmental inputs
- Sequence of CPs from lower to higher brain functions
- Deprivation of essential inputs leads to brain reorganization

OXYTOCIN
System Supporting SP Effects on Social Growth
- Organization of OT availability at critical limbic and neocortical sites depends on early caregiving
- OT directs young to preferentially select species specific social stimuli to form dyad-specific attachment
- OT receptors become connected to specific social cues via the system’s experience-dependent plasticity
- Dendritic mode of OT release leads to feed-forward autoregulated functioning in response to experiences during SP

BIOBEHAVIORAL SYNCHRONY
Experience Required during SP for Social Growth
- Synchrony is the mechanism by which early environment exerts its effects via coordination of biological and social processes during social contact
- Biobehavioral synchrony in mammals occurs in the context of mother’s body
- Human biobehavioral synchrony also includes the coordination of visuoaffective cues in the gaze, affect, vocal, and touch modalities
- Synchrony experienced during SP carries long-term effect on children’s social growth, stress management, emotion regulation, and mental health

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Feldman 2015
Organs of Emotion

The Cerebral Cortex
- The Frontal Lobe
  - The Dorsolateral Cortex
  - Orbitofrontal Cortex
  - The Anterior Cingulate Cortex
- The Temporal Lobe
  - The Amygdala
  - The Hippocampus
- The Insula

The Hypothalamic-Pituitary Axis & Septal Area
- The Hypothalamus
- The Pituitary Gland
- The Septal Area

The Thalamus & Basal Ganglia
- The Thalamus
- The Subthalamic Nucleus
- The Striatum & Pallidum
- The Nucleus Accumbens
Emotion and Stress

The Parasympathetic System is activated by the inhibitory neurotransmitter acetylcholine in the brain. This system relaxes our body and calms us down.

The Sympathetic System is activated by the excitatory neurotransmitter dopamine in the brain. This system is often called "fight, fright, or flight" system.
Three Core Concepts in Early Development

Toxic Stress Derails Healthy Development

NATIONAL SCIENTIFIC COUNCIL ON THE DEVELOPING CHILD
Center on the Developing Child HARVARD UNIVERSITY

https://www.youtube.com/watch?v=rVwFkcOZHJw
“Sustained activation of the stress response system can lead to impairments in learning, memory, and the ability to regulate certain stress responses.”  NSCDC 2014
Toxic stress is the extreme, frequent, or extended activation of the stress response, without the buffering presence of a supportive adult.

Johnson et al 2013
“high stress exposure is associated with differences in the brain on both an anatomic and a functional level... data suggest an important vulnerability of the preterm brain to stressful exposures, independent of measures of severity of illness,... and thus potentially affect neurodevelopmental outcomes.”

Smith et al 2011
Neurobiology of Attachment

**Cortisol**
- Steroid released when stressed

**Dopamine**
- Pleasure & reward
- Arousal & desire
- Addictions

**Norepinephrine**
- From dopamine
- Increased memory for new stimuli

**Serotonin**
- Mood stabilizer
- Stops obsessive-compulsive behavior
Attunement
- being or bringing into harmony; a feeling of being "at one" with another being
Mother-Infant Separation

“Multiple regression models revealed that, controlling for baseline family and maternal characteristics and indicators of family instability, the occurrence of a mother-child separation of a week or longer within the first two years of life was related to higher levels of child negativity (at age 3) and aggression (at ages 3 and 5). The effect of separation on child aggression at age 5 was mediated by aggression at age 3, suggesting that the effects of separation on children’s aggressive behavior are early and persistent.”

Howard et al. 2011
"Psychosocial deprivation within any caregiving environment during early life must be viewed with as much concern as any debilitating childhood disease."

Johnson & Gunnar 2011
Disease Independent Neonatal Outcomes

- It is estimated that 50-70% of infants born preterm develop behavior problems including internalizing and externalizing problems and symptoms of Attention Deficit/Hyperactivity Disorder (ADHD)
- Infants hospitalized for CHD increase their risk for neurodevelopmental compromise if their postop LOS is > 2 weeks

Risk of violent suicide attempts patients born prematurely (OR [95%] = 2.38 [1.12–5.08] (Blasco-Fontcella et al 2013)
Risk of cardiovascular disease in adulthood (Lewandowskia et al 2013)
Risk of metabolic syndrome and obesity in adulthood (Thomas et al 2012; Finken et al 2011)
Compared with term births:

* Infants born 32-36 weeks were:
  * 1.6 x more likely to have nonaffective psychosis (schizophrenia)
  * 1.3 x more likely to have depressive disorder
  * 2.7 x more likely to have bipolar disorder

* Infant’s born < 32 weeks were:
  * 2.5 x more likely to have nonaffective psychosis (schizophrenia)
  * 2.9 x more likely to have depressive disorder
  * 7.4 x more likely to have bipolar disorder

Nosarti et al 2012
Toxic stress is a mediator between early childhood adversity and suboptimal outcomes in learning, behavior, and health.

Understanding the biology underlying these well established associations opens up new opportunities for primary prevention and early intervention.
“It is an absolute human certainty that no one can know his own beauty or perceive a sense of his own worth until it has been reflected back to him in the mirror of another loving, caring human being.”
— John Joseph Powell
Rule #1
Do No Harm
Mitigate 'toxic' stress
A new science of early childhood reveals urgency of protecting developing brains
Andrew S. Garner and Jack P. Shonkoff
AAP News 2012;33:29
DOI: 10.1542/aapnews.2012331-29

TECHNICAL REPORT
The Lifelong Effects of Early Childhood Adversity and Toxic Stress
Shonkoff et al 2012
The Role of the Neonatal Clinician?

Early Childhood Adversity, Toxic Stress, and the Role of the Pediatrician: Translating Developmental Science Into Lifelong Health
Committee on Psychosocial Aspects of Child and Family Health, Committee on Early Childhood, Adoption, and Dependent Care, and Section on Developmental and Behavioral Pediatrics, Andrew S. Garner, Jack P. Shonkoff, Benjamin S. Siegel, Mary I. Dobbins, Marian F. Earls, Andrew S. Garner, Laura McGuinn, John Pasco, and David L. Wood

*Pediatrics* 2012;129;e224; originally published online December 26, 2011; DOI: 10.1542/peds.2011-2662
Evidence-based

Core Measures for Age-appropriate Care
Age-Appropriate
Assumptions of IMTN Concept

1. Following birth, the infant’s health status is compromised
2. Primary care of the infant is transferred to NICU caregivers
3. NICU experience differs from routine hospital stay
4. Infant experiences increased stress, parental separation, & pain
5. NICU experiences contribute to infant’s allostatic load increasing vulnerability & risks for poorer outcomes
Erikson Life-Stage Virtues

- HOPE – basic trust vs. mistrust (0-1)
- WILL – autonomy vs. shame & doubt (1-3)
- PURPOSE – initiative vs. guilt (3-6)
- COMPETENCE – industry vs. inferiority (6-11)
- FIDELITY – identity vs. role confusion (12-mid 20’s)
- LOVE – intimacy vs. isolation (young adult – mid 20’s to early 40’s)
- CARING – generativity vs. stagnation (40’s to 60’s)
- WISDOM – ego integrity vs. despair (>60’s)
Serve & Return Interaction Shapes Brain Circuitry

Three Core Concepts in Early Development

NATIONAL SCIENTIFIC COUNCIL ON THE DEVELOPING CHILD
Center on the Developing Child

https://www.youtube.com/watch?v=m_5u8-QSh6A
Eco-Bio-Developmental Model of Human Health and Disease

Ecology

Biology

Development

And together they drive development across the lifespan.
Core Measures for Age-Appropriate Care

- Protected Sleep
- Healing Environment (physical, human, systems)
- Pain & Stress (Prevention, Assessment, Management)
- Family Collaborative Care
- ADLs (Posture, Feeding, Skin Care)

Coughlin et al 2009; Coughlin 2011; Coughlin 2014; Coughlin 2016

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What’s the frequency in which you provide the following?

1. Prevent procedural pain (using appropriate pharm/non-pharm strategy)
   - Never
   - Occasionally
   - Sometimes
   - Often
   - Always

2. Modify caregiving practices based on the infant’s behavioral stress cues
   - Never
   - Occasionally
   - Sometimes
   - Often
   - Always

3. Ensure that the first oral feeding is at the breast for breastfeeding mothers
   - Never
   - Occasionally
   - Sometimes
   - Often
   - Always

4. Respond to infant alarms or cries regardless of patient assignment status
   - Never
   - Occasionally
   - Sometimes
   - Often
   - Always
Missed Care in the NICU

- Most frequently missed cares (self report by nurses)
  - Participating in rounds
  - Discharge planning
  - Oral care for ventilated infants
  - Educating and involving parents in care
  - Comfort care
  - Oral feedings

Rochefort & Clarke 2010; Tubbs-Cooley et al 2014
Making it REAL!
Strategy Implementation Model

Leadership

Strategy Creation

Alignment

Execution

Accountability
Improvement Methodology

Act    Plan    Act    Plan    Act    Plan
Study  Do      Study  Do      Study  Do

What gets measured gets managed!

**Kangaroo Care Progress**
- Annual Kangaroo-o-thon occurs each May
- Mandatory staff education at Annual Competencies on Standing Transfer, use of wraps and AC recliner

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**Pain Assessment Documentation Improvement**
- Transition to N-PASS tool for pain assessment challenging for staff
- Project with CHOA data analytics showed no correlation between VS score and actual VS
- Improvement after bedside nurse-to-nurse education

**Correct N-Pass Vital Signs Score**
- Before Education vs. After Education

**Quiet Time Outcomes**
- Decreased Sound Levels Overall
  - Sounds levels measured in four areas of the unit
  - Measurements during QT and two random non-QT hours

**The Speech Intelligibility Index**
- QT could promote patient safety by improving communication
- QT could contribute to parent-infant bonding

**Sustainability of Quiet Time**
- Overall sound levels at vocal frequencies (160-8000Hz) decreased after initiation of Quiet Time. Because of this, it would appear that Quiet Time is a sustainable project because the decrease in sound is due to changes in staff behavior, not background environmental noise.
“It is easier to build strong children than to repair broken men.” - Frederick Douglas
“A person is a person, no matter how small”

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References


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