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Discharge Planning | June 8, 2022

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1

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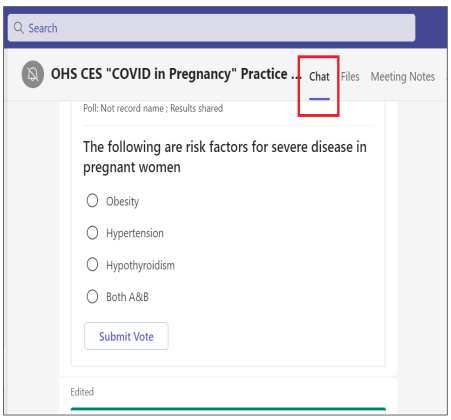

4

Disclosure Information

- I have no pertinent financial disclosures or conflicts of interest to disclose.

5

About the Presenter

- I was born and raised in St. Louis, MO

- Attended Washington University for undergraduate studies double majoring in biology and psychology
- Attended University of MO – Columbia for medical school
- Pediatric Residency: University of MI
- Neonatology Fellowship: University of MI
- MS in Biostatistics and Clinical Research Design: University of MI

- Private Practice Neonatology:
  - 1995-1999 Mercy Hospital in St. Louis, MO
  - 1999-2022 Boone Hospital in Columbia, MO

- NRS Medical Director: November 2021

6

Interests:

- Professional Neonatology Interests:
  - Nutrition
  - Management of Respiratory Distress
  - Development
- Alternative Medicine:
  - Chinese Medicine | Energy Medicine | Homeopathy | Reiki
- Farming
  - Breeding Dexter Cattle for Beef | Animal Husbandry | Intensive Grazing
  - Organic and Biodynamic Methods of Agriculture
- Gardening
- Cooking
- Avid Reader:
  - Classical literature | All kinds of Non-Fiction | Spirituality | Astrology

7

Objectives:

1. Discuss the common clinical factors that guide neonatal discharge planning decisions.
2. Review the Neonatal Resource Services (NRS) guidelines that provide guidance and criteria for discharge planning.
3. Describe common clinical barriers that can affect the timing of discharge and therapeutic interventions that can provide neonatal support.
4. Identify discharge criteria for newborns as reviewed through audience participation in a question-and-answer session.

8

Introduction:

- Discharge planning is an important aspect of NICU hospital stay.
- It should begin early in the hospital stay with engagement of the family and care givers as much as possible
- Most of the routine admissions to the NICU are straight-forward premature infants with developmental immaturity.
- Common final barriers to discharge:
  - A/B/D events
  - Thermoregulation
  - Oral feedings
- During this presentation, we will review the developmental milestones that are typically followed as NICU patients are nearing discharge.
- For most premature infants, these milestones are successfully achieved between 35–40 weeks at which time they can be discharged to home.

9

McGowan et al. (2019)

- Study evaluating maternal immigrant status and readiness to transition from the NICU to home.
- Findings:
  - Nearly 25% of mothers of preterm infants admitted to the NICU were immigrants.
  - Only 32% of these immigrant mothers reported English as their primary language.
- Immigrant mothers:
  - Were more likely to fear for their infants' lives
  - Felt that their infants were not receiving enough medical care / attention
  - Perceived themselves to be less ready for discharge

Conclusion: It is important to provide culturally competent care and establish effective communication with immigrant families.

10

Hemodynamic Stability:

- Catch-all phrase that includes a combination of competencies:
  - Successful oral feeding
  - Thermoregulation
  - Respiratory control
- When infants have hemodynamic stability, they are ready for discharge.

11

Respiratory Stability:

- Typical normal vital signs in a newborn:
  - RR < 60 breaths per minute
  - HR 100–160 beats per minute

12

Persistent Tachypnea without an Oxygen Requirement:

- Requires further evaluation:
  - CXR
  - Echocardiogram
  - Blood gas – looking for CO2 retention or metabolic acidosis
  - CBC – looking for anemia or infection
  - BMP – looking for metabolic derangements
- Common clinical situations when tachypnea is present closer to discharge:
  - Atypical TTN
  - Infants recovering from congenital pneumonia
  - Infants with NAS
  - Infants weaning from the incubator to the open crib – due to overheating

13

Monitoring Period Off Oxygen Prior to Discharge:

- Term infant → up to 24 hours
- Preterm infant → up to 48 hours
- Any infant with a history of failing a RA trial → up to 48 hours
- Some infants may need a longer monitoring period if they recently weaned off a steroid taper for CLD → up to 48 hours or as recommended by the pulmonologist.

14

A/B/D Events:

- Definition for apnea of prematurity in infants < 37 weeks:
  - Apnea > 20 seconds or a shorter time duration if associated with a B/D
  - HR < 100 beats per minute with cyanosis, pallor, or hypotonia
- Treatment includes:
  - caffeine
  - providing increased respiratory support
  - PRBC transfusion if anemia is a factor
- Stop caffeine:
  - 33–35 weeks CGA
  - Apnea free for 5–7 days and off HFNC / CPAP
- Once caffeine is stopped, a 7-day count down period is allowed for the caffeine level to drop below the therapeutic level.
- Infants who have feeding related events or isolated bradycardia should be trialed off caffeine as the presence of caffeine can aggravate GER symptoms.

15

Mechanism of Action of Caffeine:

- Competitive inhibitor of adenosine receptors
- Adenosine is an inhibitory neuromodulation of respiratory drive.
- Blockage of the adenosine receptor results in:
  - Increased ventilatory responsiveness to CO2
  - Reversal of central hypoxic depression of breathing
  - Enhanced force of diaphragmatic contraction
  - Improved pharyngeal muscle tone
  - May also reduce the effects of hypoxia on perinatal white matter injury

16

Benefits of Caffeine Prophylaxis:

- When caffeine is started prophylactically at < 3 days of age:
  - Shorter duration of mechanical ventilation
  - Lower risk of developing BPD
  - Lower likelihood for needing surgical ligation of the PDA

17

Monitoring for an event free period:

- Term infants → up to 3 days
- Preterm infants → up to 5 days
- Periodic breathing is a normal breathing pattern in newborns – accounting for up to 10-15% of breathing time especially during deep sleep. For late preterm infants, it is often associated with B/D's and may require monitoring based on the frequency and severity of the B/D's

18

Home Apnea Monitors:

- Candidates:
  - Infants who are otherwise ready for discharge but are still having persistent A/B/D events that are generally infrequent and self-resolving.
  - Infants with a tracheostomy or airway abnormality such as TEF
  - Infants with a neurologic or metabolic disorders affecting respiratory control
  - Infants with CLD / BPD especially those going home on NC oxygen, positive airway pressure, or mechanical ventilation
- Apnea of prematurity is generally resolved by 44 weeks CGA.
- Most infants are followed on the home monitor for at least 1 month after discharge.
- The monitor can typically be discontinued when the infant has been event free for a period of 2 weeks.

19

Indications for Medical Director Escalation:

- An infant being monitored for > 7 days after stopping caffeine
- A preterm infant being monitored for > 5 days for A/B/D events
- A term infant being monitored for > 3 days for A/B/D events
- Infant having self-limited B/D events that prolong the length of the hospital stay
- Infant with feeding related events that resolve with interrupting the feeding that extend the hospital stay
- The hospital stay is extended in an asymptomatic infant due to a pneumo-cardiogram that is interpreted as abnormal

20

Thermoregulation:

- A normal axillary temperature in an open crib with appropriate clothing:
  - 36.5–37.4 °C
  - 97.7–99.3 °F
- Typical environmental air temperature ranges from:
  - 20–25 °C
  - 68–77 °F
- Typical weaning incubator air temperatures:
  - 28 °C = 82.3 °F
  - 27 °C = 80.6 °F
  - 26 °C = 78.8 °F
  - 25 °C = 77 °F

21

Infants Ready for an Open Crib Trial:

- Incubator temperature ≤ 28 °C (25-28 °C)
- Infant is capable of self-regulation the body temperature
- Infant with a weight gain of 10-15 g/kg/d
- Infant having stable vital signs without significant A/B/D events
  - often periodic breathing increases during the weaning process and stops upon going to the crib
- Infant usually weighs > 1500 grams
- Preterm infants are usually to the crib before taking full oral feedings

22

Monitoring Period for Stable Temperature in the Crib:

- AAP supports monitoring for stable body temperatures in the crib:
  - For infants ≥ 34 weeks → 12 hours
  - For infants < 34 weeks → up to 48 hours
  - For infants who previously failed the crib → up to 48 hours
- The 8th Edition of GL of Perinatal Care states:
  - To ensure infant readiness for discharge, the infant must demonstrate adequate maintenance of normal body temperature when fully clothed in an open bed with normal ambient temperature (20-25 °C or 68-77 °F) for more than 24 hours.
- A crib failure occurs when the axillary temperature < 36.5 °C or 97.7 °F.

23

Indications for Medical Director Escalation:

- Infant remains in the incubator with a temperature of ≤ 28 °C
  - **AND** the infant is clinically well appearing
  - **AND** there are no other medical indications for staying in the incubator

24

Feedings:

- General guidelines for adequate weight gain:
  - Preterm infant < 2 kg → 15–20 gm / day
  - Preterm infant > 2 kg → 20–30 gm / day
  - Term infant → 25–35 gm / day

25

Weight and Hydration:

- Term infants:
  - Weight loss of up to 12% below the BW is acceptable
  - No signs of dehydration
  - Taking oral feedings well – adequate feeding vigor and appropriate volume
- Late preterm infants:
  - Do not have to exhibit weight gain PTD
  - Weight loss should not exceed 7% below the BW or > 3% per 24 hours
  - Taking oral feedings well – adequate feeding vigor and appropriate volume
  - Voiding and stooling appropriately
- Preterm infants (< 36 weeks):
  - May require 48 hours of adequate oral volumes and positive weight gain
  - 100 ml/k/d prevents dehydration
  - 150-165 ml/k/d usually supports optimal growth with a 20 or 22 calorie diet
  - 180-220 ml/k/d can be seen in infants during catch up growth

26

Monitoring Period after the last NG feeding and off IVF:

- For infants ≥ 34 weeks at birth → up to 24 hours
- For infants < 34 weeks at birth → up to 48 hours
- Based on the specific feeding history, a longer period may be needed.
- If all other discharge criteria are met with IVF as the last barrier:
  - Up to 24 hours off IVF

27

Home Gavage Feedings:

- Gavage feedings may be utilized in the home to supplement breast or bottle feedings as a temporary solution but may not be available in all communities. Institutions that utilize home NG feedings usually require that the infant is taking more than 50% of the feeding orally. It is assumed that the NG feedings are a temporary measure and that the infant will achieve full oral feedings.
- Gastrotomy tube (G-tube) should be considered when long-term nutritional support is required. Decision for placement of a G-tube usually occurs at 44 weeks and when oral feedings are not progressing.

28

Transition to Home Feeding Regimen:

- This should be completed before the infant is ready for discharge to monitor for tolerance and appropriate positive weight gain.
  - Adjusting the calorie density
  - Transitioning off an all-human milk diet to cow's milk products starting at 32–34 weeks CGA
  - Prolacta recommends starting at 34 weeks and adding 2 cow's milk feedings per day as tolerated until the infant is on all cow's milk feedings – usually by the 4th day the transition is complete.
- All-human milk diet is typically recommended for infants:
  - < 1500 grams at birth
  - < 32 weeks GA at birth

29

Hypoglycemia | Symptomatic

- Symptoms:
  - Jitteriness / tremors
  - Hypotonia
  - Changes in LOC
  - A/B/D events
  - Tachypnea
  - Poor suck
  - Poor oral feeding vigor
  - Hypothermia
  - Seizures
- Goal glucose levels by age:
  - Infant < 48 hours of age →
    - Glucose > 50 mg/dL
  - Infant > 48 hours of age →
    - Glucose > 60 mg/dL

30

Hypoglycemia | Asymptomatic

- Risk Factors:
  - Preterm infants
  - IUGR / SGA infants
  - LGA infants
  - Infants of diabetic mothers
- Goal Glucose levels by age:
  - < 4 hours → > 25 mg/dL
  - 4–24 hours → > 35 mg/dL
  - 24–48 hours → > 45 mg/dL
  - > 48 hours → > 60 mg/dL

31

Monitoring Period for Stable Glucose levels:

- Our guidelines allow for a 24-hour monitoring period for stable glucose levels on the home feeding regimen.
- A 6-hour fasting glucose challenge should be considered for those infants requiring IVF's and not reaching a glucose level of > 60 mg/dL by 72 hours of age.
- For infants requiring diazoxide or hydrocortisone, a 48-hour monitoring period for stable glucose levels off the medication and on the home feeding regimen is appropriate unless endocrinology recommends a longer monitoring period.

32

Early Onset Sepsis

- Infections that start in the first 72 hours of life
- Common pathogens:
  - Term and late preterm infants → GBS, E. coli
  - Preterm infants (GA < 34 weeks) → E. coli, GBS

33

Indications for Medical Director Escalation:

- An asymptomatic full-term infant whose mother is GBS colonized and received adequate GBS prophylaxis during labor and without a diagnosis of chorioamnionitis who is admitted to the NICU for antibiotics treatment.
- GBS early onset bacteremia treated with IV antibiotics for > 10 days
- Uncomplicated GBS meningitis treated with IV antibiotics for > 14 days
- An asymptomatic infant with a negative sepsis evaluation at 48 hours with a plan for continued antibiotic treatment
- Use of the CBC or CRP as the sole reason to initiate or determine the duration of antibiotic treatment

34

Special Considerations:

- There are clinical situations in which an infant is diagnosed with culture negative sepsis or pneumonia and a full course of IV antibiotics is appropriate.
- Gram negative infections such as E. coli usually require a longer course of antibiotic treatment:
  - Early onset sepsis → 10-14 days of antibiotics
  - Meningitis → 21 days of antibiotics
- Congenital syphilis is treated with 10 days of IV PCN G.

35

Hyperbilirubinemia

- This is usually not a discharge issue for premature infants who are < 34 weeks as phototherapy has been discontinued long before discharge. Some premature infants may have breast milk jaundice at the time of discharge, but this condition rarely requires treatment with phototherapy.
- The goal of using phototherapy is to prevent kernicterus (AKA bilirubin-induced neurologic dysfunction or BIND) and the need for a double volume exchange transfusion.
- BIND is due to selective brain damage from free (unbound / unconjugated) bilirubin that crosses the blood-brain barrier and binds to brain tissue causing cytological injury of these brain cells.
- There are 2 clinical stages:
  - Acute bilirubin encephalopathy (ABE)
  - Chronic bilirubin encephalopathy (CBE) or Kernicterus

36

3 Phases of ABE:

- Early (subtle signs)
  - Sleepiness but arousable
  - Mild to moderate hypotonia
  - High-pitched cry
- Intermediate: emergent exchange transfusion at this time may prevent BIND
  - Fever
  - Lethargy with poor suck
  - Irritable and jittery with strong suck
  - Mild to moderate hypertonia with backward arching of the neck and trunk with stimulation
- Advanced
  - Apnea
  - Inability to feed
  - Seizures
  - Semi-comatose state that progresses to coma

37

CBE:

- Develops over the first year of life
- Signs | Symptoms:
  - Choreoathetoid cerebral palsy
  - Sensorineural hearing loss
  - Gaze abnormalities especially limitation of upward gaze
  - Dental enamel hypoplasia

38

Risk Factors for Readmission for Hyperbilirubinemia:

- Early hospital discharge (≤ 2 days)
- GA < 39 weeks
- Mother of Asian country
- Vaginal birth
- First-time mother
- Breast feeding (or lack of breast feeding adequately)

39

Treatment Threshold Values

- For infants > 34 weeks or readmissions
  - InterQual
  - Bhutani curve
  - BiliTool

40

Factors that Influence the Need for Phototherapy:

- Gestational age and the age at which jaundice presents
- Presence of hemolytic disease (ABO or Rh)
- Presence of G6PD deficiency, hypothyroidism, galactosemia
- Presence of illness (sepsis)
- Presence of extensive bruising, cephalohematoma, IVH, swallowed blood from delivery
- Rate of rise (general rule of thumb – not > 6 mg/dL per 24-hour period or > 0.2 mg/dL per hour)

41

Stopping Phototherapy

- Phototherapy is stopped when the bilirubin level is 2-4 points below the treatment threshold level at which phototherapy was initiated.
- Rebound bilirubin level if needed is generally done at approximately 12 hours after stopping phototherapy.
- Adjunct Therapies:
  - IV hydration
  - IVIG infusions
  - Albumin infusions

42

NAS:

- Short acting opioids:
  - Morphine
  - Fentanyl
  - Hydrocodone
  - Heroin
  - Codeine
- Longer acting opioids:
  - Methadone
  - Subutex
- Short acting benzodiazepines:
  - Alprazolam (Xanax)
  - Lorazepam (Ativan)
- Longer acting benzodiazepines:
  - Diazepam (Valium)
  - Librium
  - Clonazepam (Klonopin)
  - Flurazepam (Dalmane)

43

Monitoring Period for NAS Symptoms:

- Short acting opioids or benzodiazepines → 3 days
- Longer acting opioids or benzodiazepines → 5 days
- Opioids + Benzodiazepines → 4–7 days

44

Pharmacologic Treatment

- Start weaning the dose when NAS scores are consistently < 8 for 1-2 days
- Decrease the dose by 10-20% (based on the highest dose needed) every 1-2 days for morphine and every 2-4 days for methadone
- Stop the medication when the dose is 10% of the highest dose after 24-48 hours
- Infant can be discharged within 2 days of stopping opioid medication treatment if NAS scores remain below treatment levels
- For clonidine, infants are monitored for 48 hours off treatment
- Phenobarbital can be weaned as an outpatient

45

Indications for Medical Director Escalation:

- No weaning of opiate medication for > 48 hours despite readiness and acceptable NAS scores
- An asymptomatic infant who remains hospitalized for > 5 days
- An infant with NAS scores below treatment levels who remains in the hospital for > 48 hours after stopping medication
- When non-pharmacologic care has been optimized and the infant has persistently elevated NAS scores without the medical team starting pharmacologic treatment

46

Car Seat Challenge:

- Infants for whom screening is recommended:
  - < 37 weeks GA at birth
  - BW < 2.5 kg
  - Infants at risk for obstructive apnea, bradycardia, hypoxemia (TEF)
  - Infants with hypotonia (Downs Syndrome)
  - Infants with micrognathia (Pierre Robin Sequence)
  - Infants who have undergone cardiothoracic surgery
- Recommended duration: 90-120 minutes

47

Car Seat Failures:

- If the infant does not pass the car seat challenge:
  - Repeat the car seat challenge within 24 hours
  - Consider another brand of car seat
  - Consider a car bed
  - Consider using a positioning device (Hug Me Joey)
- For infants who persistently fail the car seat or car bed challenge, discharge should be delayed and an investigation for a cardio-pulmonary abnormality should be sought.
- If an infant is otherwise clinically stable, discharge is allowed with the following advice:
  - An adult should ride in the back seat to visually monitor the infant during travel and time in the upright position should be limited.

48

Chronic Care | Complex Discharges:

- Specific items to be completed to ensure a smooth discharge:
  - Identify complex care needs, goals for discharge, plans for discharge needs
  - Facility to identify in network DME and home health providers
  - Special home assessments for equipment use should be done in advance to identify problems and allow for upgrades if needed
  - Prior authorization for medications, DME, nursing visits
  - Medication prescriptions should be filled by the family with medicine administration teaching completed
  - Arrange follow up appointments with PMD and specialists
  - Need for transfer to a skilled nursing facility (SNF), acute inpatient rehab (AIR), or long-term care (LTC) should be identified early with a pre-authorization completed
  - Referral to the NRS Family Advocacy CCM Team
  - Outreach to Special Needs Initiative Team if needed

49

Indications for Medical Director Escalation:

- Stable infants receiving chronic care management who do not require inpatient hospitalization as defined by infants who have not had a change in skilled needs for 2 weeks and caregiver education is completed.
- Infant with complex discharge needs (G-tube, home ventilator, needing pediatric per diem nursing (PDN)) and no discharge plan in place.
- Any infant > 40 weeks CGA **AND** > 5 weeks old who remains on a ventilator or is gavage dependent.

50

Other Considerations:

- Complex Care Patients who need PND as part of their home care, may need to stay inpatient until PND can be arranged.
- Allow approximately 1 week for discharge with a tracheostomy, G-tube, ventilator.
- Allow 1-2 days for discharge with NC oxygen.

51

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Thank You.

52