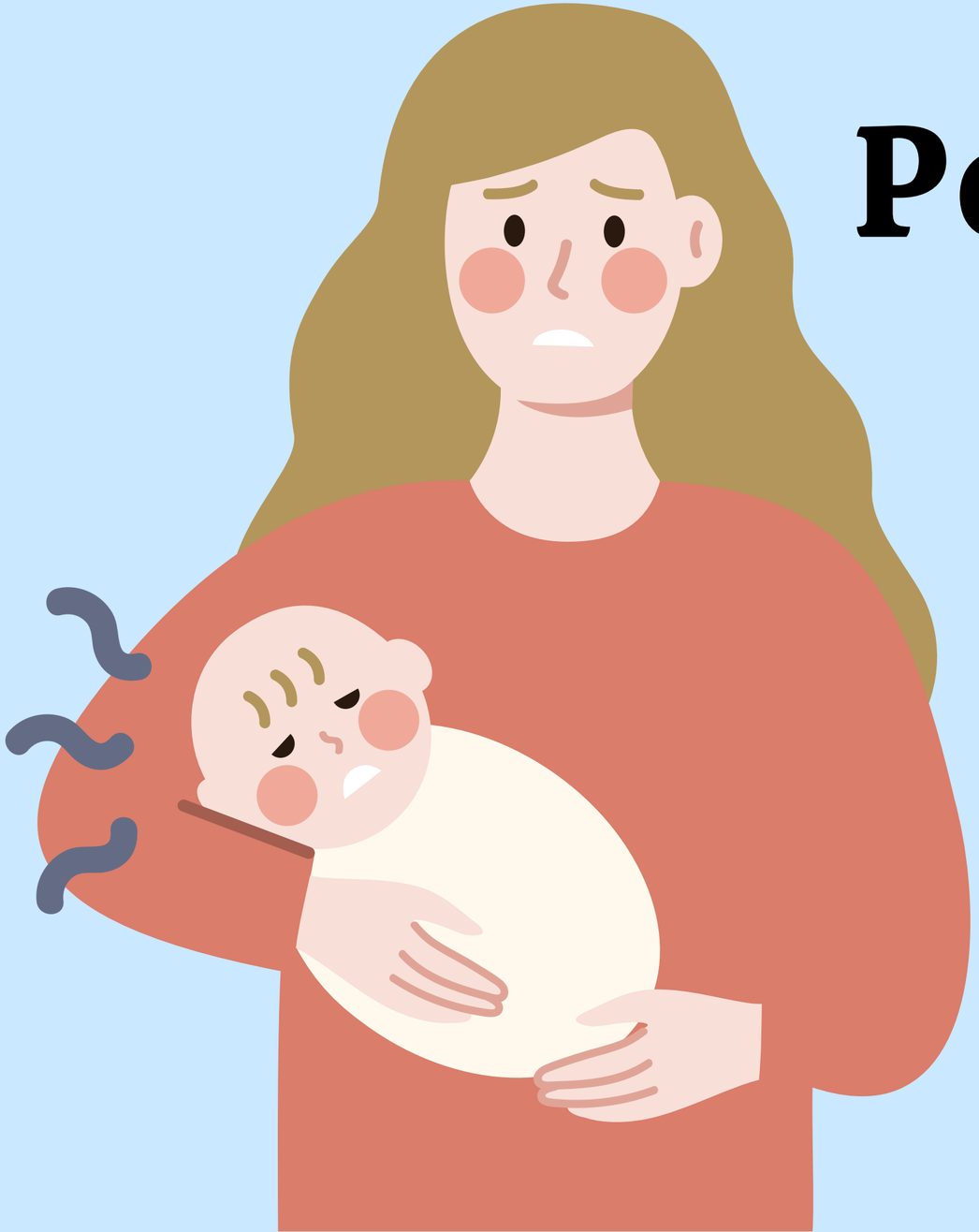
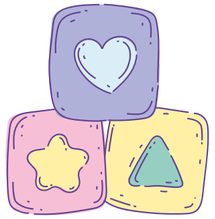


Pediatric Nursing Grand Rounds Presentation

OLD DOMINION UNIVERSITY, NURS 421

Presented by: Briana Leinart

Topic Outline



PATIENT INTRODUCTION

CLINICAL HISTORY AND ASSESSMENT

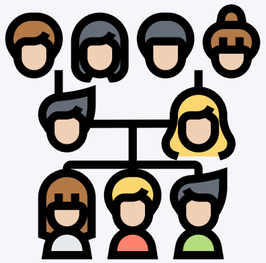
NURSING CARE PLAN

NURSING RESEARCH

Patient Introduction

- S.S. is a five-month-old Caucasian infant born at 25 weeks gestation and currently weighs 2.9 kg. She is full code status, has no known allergies, and has a history of congenital hypothyroidism. She was transferred from Portsmouth's medical to CHKD on September 27th, 2022, for a swallow screen. Shortly after the patient was admitted to CHKD, she started having difficulty feeding, had a distended abdomen, and had the presence of blood in her stool. She was diagnosed with Necrotizing Enterocolitis (NEC) which led to Disseminated Intravascular Coagulation (DIC) and Short Bowel Syndrome.

Patient History and Assessment



Family/Pyschosocial History

- Mother has a history of bipolar disorder.
- Father has a history of depression.
- In 2020, the family had a baby pass after birth.

Developmental Stage

- Erikson's Developmental Theory - Trust Vs. Mistrust (from birth to one year)
- Requires the caregivers to provide basic needs for the infant by feeding, changing diapers, cleaning, touching, holding, and talking to the infant.

Cultural Considerations

- The family's religion was Christianity. A cross and bible was present in the patients room and the family was frequently visited by the Chaplain at CHKD.
- The infant's father is in the United States Navy.

Necrotizing Enterocolitis (NEC)

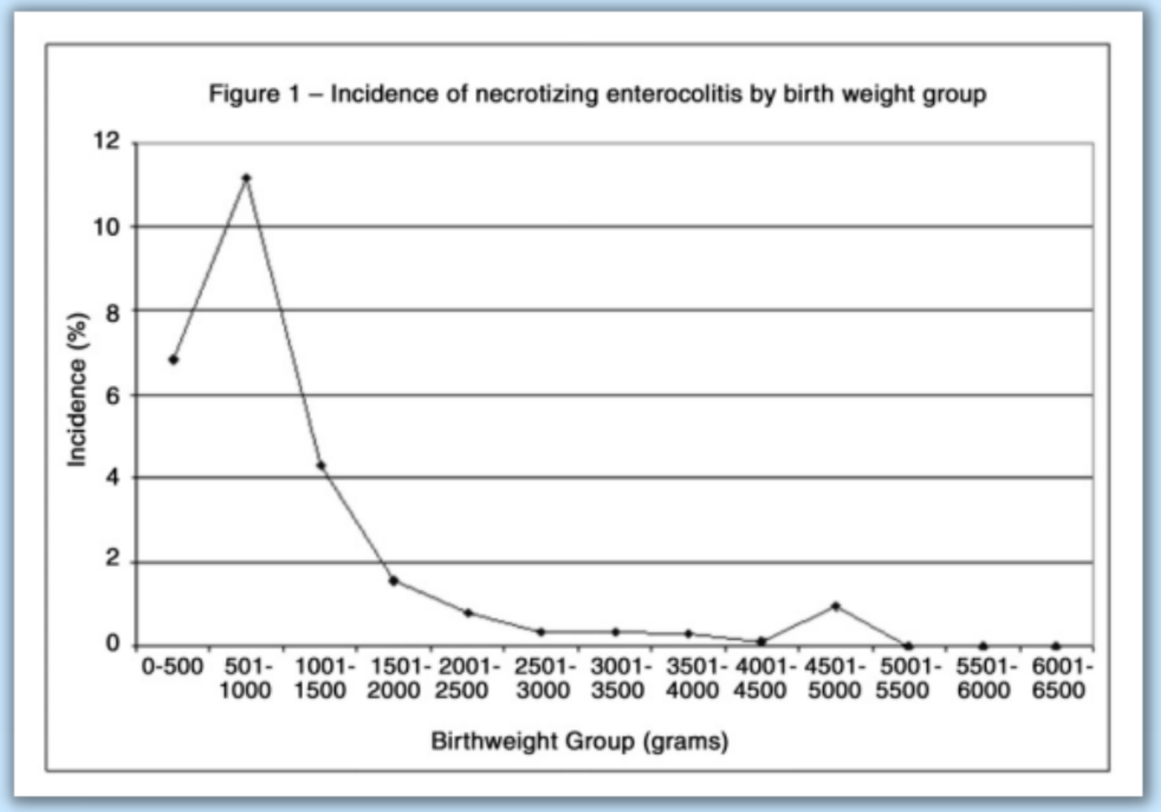
What is Necrotizing Enterocolitis?

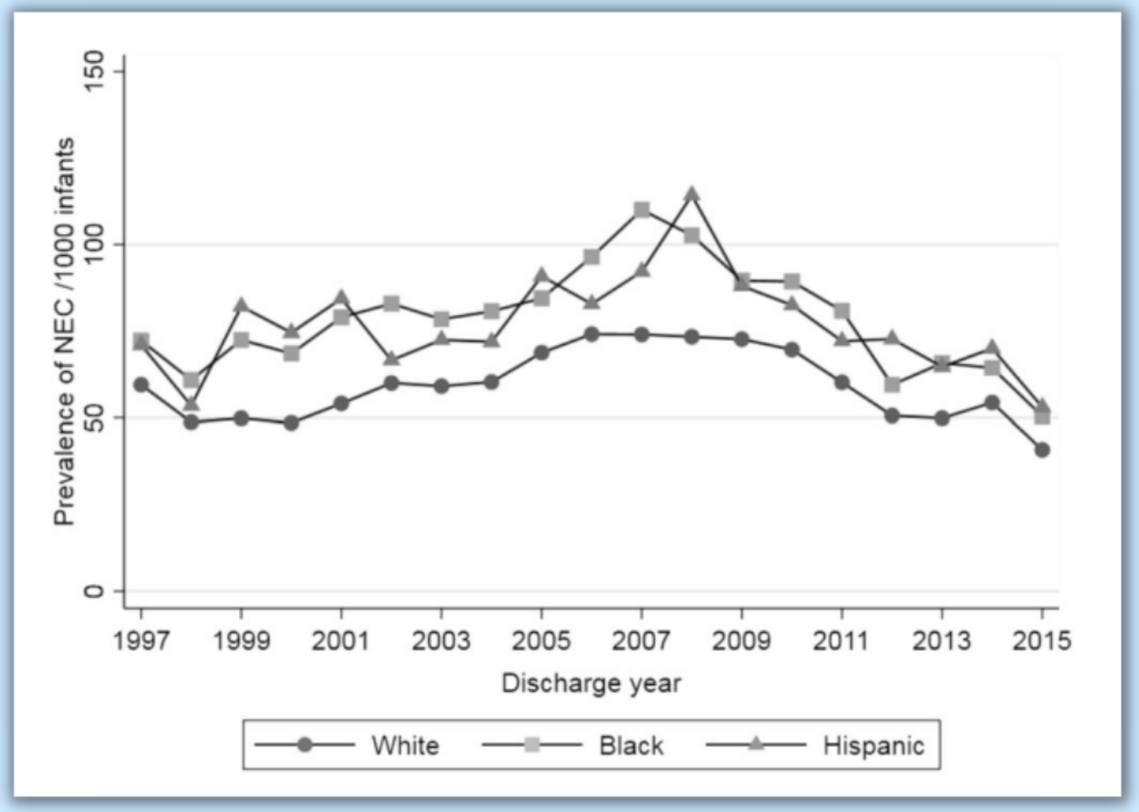
- Necrotizing enterocolitis (NEC) is one of the most common and severe infections and intestinal diseases among premature infants.
- The wall of the intestine is invaded by bacteria, which cause local infection and inflammation that can ultimately destroy the wall of the bowel. Such bowel wall destruction can lead to perforation of the intestine and spillage of stool into the infant's abdomen, which can result in an overwhelming infection and death.

Common Signs and Symptoms of Necrotizing Enterocolitis

- One of the first signs of NEC is the inability of the infant to tolerate the feedings. This is often associated with abdominal distention and vomiting bile (green).
- Diarrhea or bloody stools
- Lethargy and difficulty feeding
- If the infection is not recognized early, then the child may develop a low respiratory rate or periodic breathing (apnea) and a low heart rate that may necessitate insertion of a breathing tube.

Prevelence of NEC





Medscape® www.medscape.com

Stages of NEC[1,8-10]

Classification	Stage I Suspected NEC	Stage II Proven or Definite NEC	Stage III Advanced NEC
Systemic signs	• Temperature instability • Apnea • Bradycardia • Cyanosis • Lethargy • Glucose instability • Mimics signs of infection	• Stage I signs plus • Possible mild metabolic acidosis • Mild thrombocytopenia • Poor perfusion	• Stage I and II signs plus • Signs of shock • Rapid deterioration of vital signs • Mixed acidosis • Respiratory compromise • Hypotension • DIC • Neutropenia
GI signs	• Increased NG residuals • Abdominal distension • Vomiting (may be billious) • Ileus • Possible abdominal tenderness • Occult or frank blood in stools	• Stage I signs plus • Absent bowel sounds • Abdominal tenderness • Possible abdominal cellulitis or RLQ mass	• Stage I and II signs plus • Peritonitis • Marked abdominal tenderness & distension
Classic radiographic signs	• Normal • Possible mild GI dilation (dilated loops of bowel)	• Intestinal dilation • Fixed dilated loops of bowel • Pneumatosis intestinalis • Ascites • Possible portal venous gas	• Likely pneumoperitoneum

Sample radiographs

Stage I

Pneumatosis

Pneumoperitoneum with free air

NOTE. Clinical manifestations and radiographic features of various stages of neonatal NEC.
Abbreviations: GI, gastrointestinal; NEC, necrotizing enterocolitis; NG, nasogastric; RLQ, right lower quadrant; DIC, disseminated intravascular coagulation.

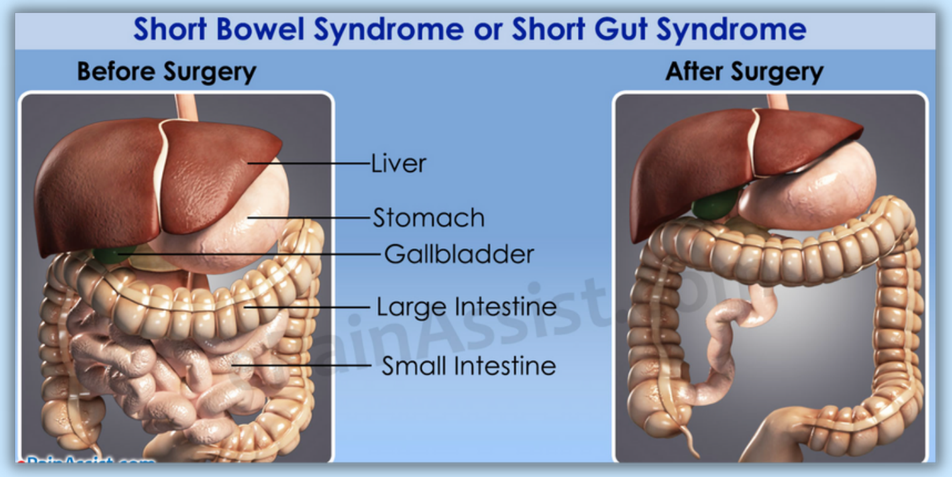
Source: Adv Neonatal Care © 2003 W. B. Saunders

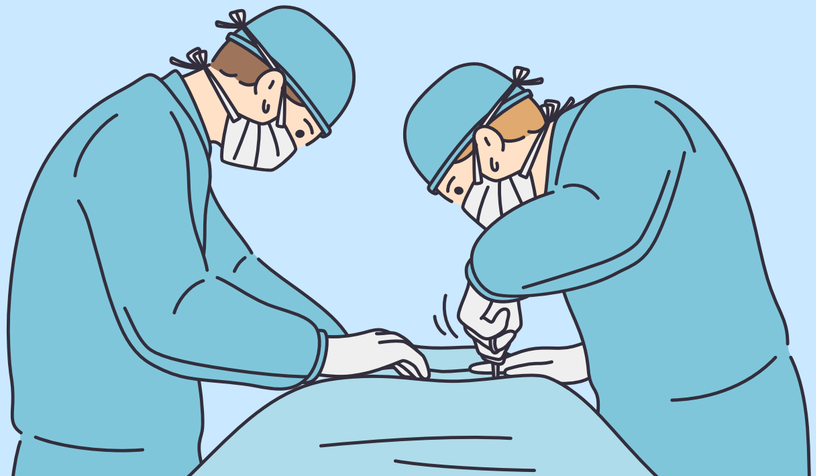
Bell's Staging Criteria for NEC

Stages of NEC

- **Stage 1: Suspected NEC**
  - **Systemic Signs:** Temperature instability, apnea, bradycardia, cyanosis, lethargy, glucose instability, and signs of infection.
  - **GI Signs:** Increased NG residuals, abdominal distension, emesis, possible abdominal tenderness, and blood in the stool.
  - **Radiographic Signs:** Normal or mild GI dilation.
- **Stage 2: Proven or Definite NEC**
  - **Systemic Signs:** Stage 1 signs with mild metabolic acidosis, mild thrombocytopenia, and poor perfusion.
  - **GI Signs:** Stage 1 signs with absent bowel sounds, abdominal tenderness, or possible abdominal cellulitis.
  - **Radiographic Signs:** Intestinal dilation, pneumatosis intestinalis (the presence of gas within the wall of the small or large intestine), ascites, and possible portal venous gas.
- **Stage 3: Advanced NEC**
  - **Systemic Signs:** Stage 1 and 2 signs along with signs of shock, rapid deterioration of vital signs, mixed acidosis, respiratory compromise, hypotension, DIC, and neutropenia.
  - **GI Signs:** Stage 1 and 2 signs with peritonitis and marked abdominal tenderness and distension.
  - **Radiographic Signs:** Likely pneumoperitoneum, the presence of air or gas in the abdominal (peritoneal) cavity.

Disseminated Intravascular Coagulation (DIC) & Short Bowel Syndrome





What is Disseminated Intravascular Coagulation?

- DIC is a complex condition that leads to activation of coagulation; it usually occurs in critically ill children. Common triggers of DIC include septic shock, the presence of endotoxins and viruses, tissue necrosis or injury, and cancer treatment.
- In DIC, thrombin is generated, fibrin is deposited in the circulation, and platelets are consumed. Deficiencies of coagulation and anticoagulation pathways occur. Hemorrhage and organ tissue damage results and can be irreversible if not recognized and treated immediately.

What is Short Bowel Syndrome?

- Short bowel syndrome is a clinical syndrome of nutrient malabsorption and excessive intestinal fluid and electrolyte losses that occurs following massive small intestinal loss or surgical resection. The degree of malabsorption is usually related to the extent of resection of the small bowel, absence of ileocecal valve or colon, and small bowel bacterial overgrowth.
- People with short bowel syndrome cannot absorb enough water, vitamins, minerals, protein, fat, calories, and other nutrients from food.

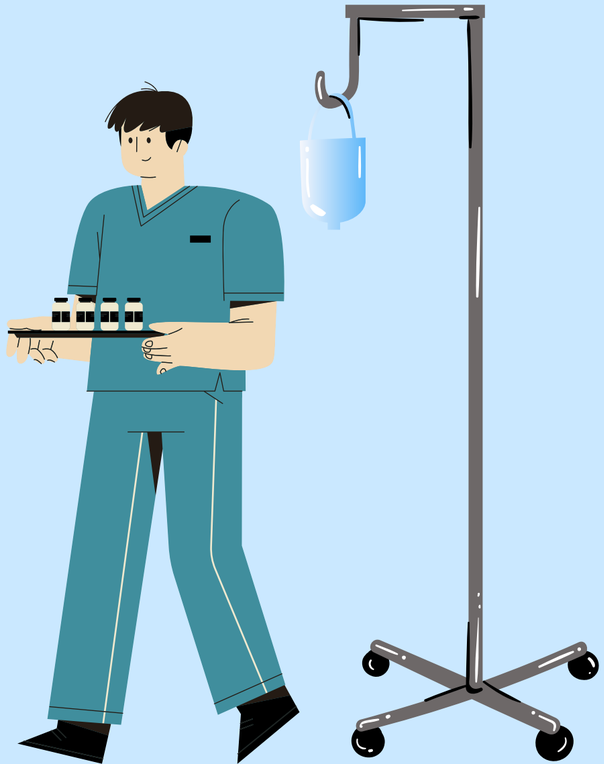
Nursing Care Plan

Assessment Data:

- Hypoactive bowel sounds in all four quadrants.
- Slight abdominal distension and firmness.
- Pale and mottled skin, primarily on her hands and feet.
- Red and moist stoma on RLQ.
- DVT located in the left femoral vein.
- Gastromy tube site at LUQ is WNL.
- PICC line at LLE is WNL.
- Nasal Cannula - 2L/min, decreased to 1L/min after rounds.
- 11ml of yellow fluid was removed from her ostomy bag q4h.
- FLACC Scale Pain Score - 0
- Vital signs: Temperature - 37.0 C, Heart Rate - 162 bpm, Sp02 - 97%, Blood Pressure - 104/54 (69), and Respirations - 62 bpm
- Labs:
    - **10/5:** Glucose - 602 mg/dL, Hemoglobin 8.2 g/dL, Hematocrit - 34%, Platelets - 35, and gram-negative bacteria present in blood culture results.
    - **10/6:** Hemoglobin - <8.0 g/dL, Hematocrit <15%, Platelets - 27, RBC - 3.03, and WBC - 38.9 (H&H unmeasurable due to levels being too low).
    - **11/15 (day of care):** Hemoglobin - 15 g/dL, Hematocrit - 46.3%, Platelets - 74, RBC - 5.06, WBC - 23.8, and Glucose - 71 mg/dL.

TABLE 24.1 Normal Hemogram Values

Age	WBC ($\times 10^3/mm^3$)	RBC ($\times 10^6/mm^3$)	Hgb (g/dL)	Hct (%)	MCV (fL)	MCH (pg/cell)	MCHC (g/dL)	Platelets ($\times 10^3/mm^3$)	RDW (%)	MPV (fL)
Birth–2 weeks	9.0–30.0	4.1–6.1	14.5–24.5	44–54	98–112	34–40	33–37	150–450	—	—
2–8 weeks	5.0–21.0	4.0–6.0	12.5–20.5	39–59	98–112	30–36	32–36	—	—	—
2–6 months	5.0–19.0	3.8–5.6	10.7–17.3	35–49	83–97	27–33	31–35	—	—	—
6 months–1 year	5.0–19.0	3.8–5.2	9.9–14.5	29–43	73–87	24–30	32–36	—	—	—
1–6 years	5.0–19.0	3.9–5.3	9.5–14.1	30–40	70–84	23–29	31–35	—	—	—
6–16 years	4.8–10.8	4.0–5.2	10.3–14.9	32–42	73–87	24–30	32–36	—	—	—
16–18 years	4.8–10.8	4.2–5.4	11.1–15.7	34–44	75–89	25–31	32–36	—	—	—
>18 years (males)	5.0–10.0	4.5–5.5	14.0–17.4	42–52	84–96	28–34	32–36	140–400	11.5–14.5	7.4–10.4
>18 years (females)	5.0–10.0	4.0–5.0	12.0–16.0	36–48	84–96	28–34	32–36	140–400	11.5–14.5	7.4–10.4

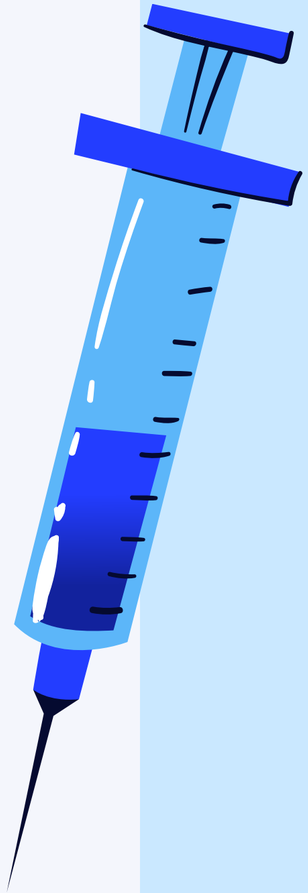


Treatment Plan - Interventions

- Blood Transfusions
  - 76 received from 9/27 to 11/1.
- Surgical Procedures
  - Exploratory laparotomy (10/7)
  - Abdominal washout (10/7)
  - Silo placement (10/7)
  - Bowel resection (10/10)
  - Jejunostomy (10/10)
  - Gastronomy - 14 french (10/10)
- Medications
  - Enoxaparin (Lovenox) - 6mg subcutaneously q12h
  - Methadone - 0.15mg q12h
  - Protonix - 3mg q12h
  - Levothyroxine - 7mcg IV push daily
- Oxygen
  - Previous history of respiratory distress and was intubated on 10/5.
  - High flow at 2L/min.
- TPN Lipids and Breast Milk
  - TPN: 0.5ml continuously
  - G-tube: 4ml of breast milk q4h (20kcal)
  - Oral care q4h

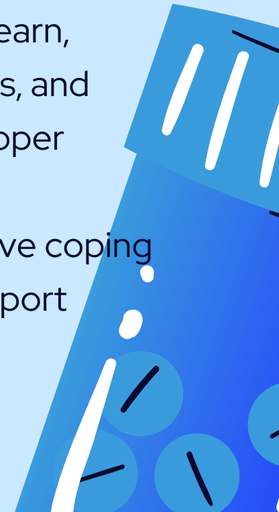
Nursing Problems

- Ineffective tissue perfusion
  - Decreased hemoglobin and hematocrit labs
  - DVT is located in LLE
  - Nurse needle stick
  - DIC and GI bleed
- Risk for infection
  - Necrotizing Enterocolitis
  - Hx of CAUTI
  - Risk for CLABSI (PICC line LLE)
  - Gastronomy/Jejunostomy
- Impaired gas exchange
  - Nasal cannula - 2L/min
  - Decreased hemoglobin labs
  - History of an acute life-threatening event (ALTE) which required her to be intubated.
- Deficient knowledge
- Risk for impaired family coping



Expected Outcomes

- The patient does not experience bleeding, as evidenced by stable hemoglobin and hematocrit levels, desired ranges for coagulation profiles, and vital signs within normal limits.
- The patient maintains optimal peripheral tissue perfusion in the affected extremity (LLE) as evidenced by strong palpable pulses, reduction/absence in pain, warm and dry extremities, and adequate capillary refill.
- The patient remains free of infection, as evidenced by normal vital signs and the absence of purulent drainage from wounds, incisions, and tubes.
- The patient maintains optimal gas exchange as evidenced by ABGs within the patient'spatient's usual range, alert responsive mentation or no reduction in LOC, relaxed breathing, and baseline HR for the patient.
- The patient's family demonstrates motivation to learn, verbalizes understanding of the patient's diagnosis, and provides return demonstration of skills such as proper feeding and ostomy bag change.
- The patient's family describes and initiates effective coping strategies and can list available resources and support systems.



Family Teaching Needs

- Infection Prevention
  - Signs and symptoms
  - When to notify their provider.
- Support group information and additional resources.
  - NEC Society - provides information sheets, emotional and mental health support group information, an online support community for families to connect with others, and even resources for bereaved families who have lost their child to NEC.

- Caring for a child with a jejunostomy and gastrostomy tube.
  - Replacing ostomy bags.
  - What the ostomy site should look like.
  - Proper skin care.
- How to properly feed their child.
  - How to use the equipment.
  - TPN administration if required.
  - G-tube feedings.

Nursing Research: The ConNECtion between Abdominal Signs and Necrotizing Enterocolitis in Infants 501 to 1500g

- **Background:** Necrotizing enterocolitis (NEC) can become severe quickly, making early recognition a priority and understanding the occurrence of abdominal and clinical signs of impending NEC important.
- **Purpose:** To examine relationships of abdominal signs up to 36 hours before the diagnosis of NEC within subgroups treated medically, surgically, or those who died.
- **Tools:** Risk factors in GutCheckNEC and eNEC are listed and scored to calculate an overall risk score that can raise awareness, but at this time, neither explicitly incorporates clinical and particularly abdominal signs.
    - Abdominal signs can raise the trigger score, in particular abdominal distension, guarding, absent bowel sounds, discoloration, bloody stool, or emesis.
- **Results:** NEC cases were exposed to less human milk and fed later. Among them, 61% had at least 1 abdominal sign 36 hours before diagnosis, 18% had 2, and 5% had 3. At 36 hours before NEC, abdominal distension, duskiness, higher gastric residual, and greater count of abdominal signs were associated with severe NEC. No medical NEC cases had abdominal signs 36 or 24 hours before diagnosis. The highest severity of NEC was related to more abdominal signs at the times leading up to and at diagnosis of NEC.
- **Implications for Nursing Practice:** Communicating a count of abdominal signs may support earlier recognition and treatment of NEC.

GutCheck^{NEC} (< 1500 grams)					Points
Gestational age (weeks) (9 max.) Calculate GA in weeks at birth based preferably on due date determined by 1st trimester ultrasound. If that is unavailable, use the gestational age assessment at delivery (Ballard or Dubowitz)		<28 9 points	28-31 6/7 8 points	≥ 32 0 points	
Race (2 max) If the infant is either Black or Hispanic race assign 2 points. If both, assign only 2 points. If not Black or Hispanic, assign 0 points.		Black 2 points	Hispanic 2 points	Other races 0 points	
Outborn (3 max) If the infant is transferred into this center from another hospital at any time after birth, assign 3 points.			Yes 3 points	No 0 points	
NICU NEC rate (23 max.) This is the annual calculated NEC rate for infants weighing less than 1500 grams at delivery. If < 2%, assign 0 points. If you do not know your rate, assume 16 points.	2-4.99% 9 points	5-7.99% 16 points	8-11.99% 19 points	> 12 % 23 points	
Exclusive human milk feeding (0 max) Defined as human milk fed at both day 7 and day 14 of life. Volume of human milk fed is not defined. If *any* milk is fed at *both* day 7 and day 14, subtract 3 points from the total score. Points cannot be subtracted until day of life 14.			Yes -3 points	No 0 points	
Probiotics (0 max) If any probiotic preparation has been given at any dose or any volume, subtract 5 points from the total score.			Yes -5 points	No 0 points	
How many culture-proven infections has the infant had since day 3 of life? (6 points max)		One 4 points	Two 6 points	None 0 points	
Packed Red Blood Cell transfusion history (8 max) If any PRBC transfusion has been given, regardless of feeding status or volume given. Once the infant receives a transfusion, from that time on it is scored "yes." Highest risk for NEC is associated within 48 hours of the transfusion. Be especially aware if HgB < 8.			Yes 8 points	No 0 points	
Hypotension treated with Inotropic Medication (4 max) If hypotension is severe and medications such as dopamine, dobutamine or milrinone are given to treat it, regardless of dose, frequency or duration of treatment. Once this is "yes" it stays "yes".			Yes 4 points	No 0 points	
Metabolic Acidosis (3 max) After the 1st 12 hours of life, if the infant experiences metabolic acidosis score "yes." This is defined as low pH associated with low serum bicarbonate (HCO_3 < 17) but normal or near normal pCO2 (pH< 7.30) or lactate > 6.1 mmol/L. If ordering clinician (physician, NNP, PA-C) documents "metabolic acidosis" code as "yes." Consider new metabolic acidosis (especially if platelets are low) in an infant with non-specific abdominal signs as concerning. It has been associated with most severe NEC forms.			Yes 3 points	No 0 points	
Score by 72 hours of life then q12-24 hrs. Rescore if new risk factor added and at 7, 14, 21, and 28 days of age. Low risk= <20 points, Moderate risk= 20-32 points, High risk= 33-36 points, Very high risk > 36 points (especially at 72 hours of age). Scores typically range from 8-58 points.					

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GutCheck
Neonatal NEC Risk Index

http://neczero.nursing.arizona.edu/

Structured communication form for clinical concern when NEC is suspected

S

Situation: Purpose of call

Hello, this is _____, I am calling about _____ in room _____
because I have some concerns about his/her assessment.

B

Background: All pertinent risk factors and recent history

Gestational Age _____ Corrected GA_____Day of Life _____
Risk Score (GutCheck^{NEC})
Feeding type (EBM, fortified?) and tolerance_____
Transfusion within the last 48 hours? _____
Relevant history _____

A

Assessment: Give your conclusion about the present situation based on assessment

Is the parent concerned? Y N
Increase in apnea/bradycardia spells? Y N
Blood present in stool or emesis? Y N
Change in color, fullness, or feel of abdomen? (Dusky or red especially concerning) Y N
Change in abdominal girth > 1cm? Y N
Bowel sounds present? Y N
Feeding tolerance: Residual color, amount, dark bilious? Y N
Emesis in last 24 hours? Y N
Stooling? Y N Change in general skin color or perfusion? Y N
Behavior: Irritability (early) or lethargy (late)? Y N
Tachycardia at rest? Y N Hypotension? Y/N
$Temp_{max}$ &/or $Temp_{min}$ x 24 hours outside normal limits? Y N
Significant increase in isolette temperature? Y N

R

Recommendation: Clarify expectations – may differ with severity of situation or institutional policy- ASK for something specific

- Hold feeding?
- Abdominal x-ray?
- Come in to see baby?
- Order sepsis workup?

Content based on evidence about NEC risk and clinical presentation (Christensen et al., 2010; Gephart, Wetzel, & Krisman, 2014; Gregory, Deforge, Natale, Phillips, & Van Marter, 2011)

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Thank you for listening!

Don't hesitate to ask any questions!