Recognition and Management of the Cardiac Patient with Necrotizing Enterocolitis (NEC) In the CICU & CACU

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Assessment for Indicators of NEC

Gastrointestinal
- ↑ Abdominal girth
- Abdominal tenderness
- Abdominal distension/cellulits
- Change in stooling pattern
- Presence of emesis (bilious or non-bilious)
- Visible, grossly bloody stool

Respiratory
- Apnea
- Desaturation
- ↑ Need or change in respiratory support
- Changes in hemodynamics

Systemic
- Temperature Instability
- HR Instability
- Increased need for sedation
- Irritability

Labs/Imaging
- ↑ CRP
- Changes in WBC
- Acidosis
- Thrombocytopenia
- Concerning radiographic findings

Exclusion Criteria
- Patient ≥ 6 months
- History of NEC as a premature infant

Assessment positive for Suspect NEC?

NO → Continue to assess for alternative causes

YES

Diagnosis

Radiology
- KUB – 2 view with left lateral decubitus

Labs
- CBC
- CRP
- Blood Gas
- Lactate

If CRP & WBC's are elevated draw blood cultures (prior to starting antibiotics)

Consider NEC?

NO → Continue to assess for alternative causes

Clinical Considerations
- Abd girth should be measured at the umbilicus q 12hr.
- Heme testing on stool is not recommended
- Presence or absence of bowel sounds is not a core indicator used by surgeons for diagnosis
- Feeds should NOT be diluted
- Draw Blood Cultures *prior to* starting antibiotics

Staging
may change on daily assessment

	Radiographic	Gastrointestinal	Systemic
Isolated Pneumatosis	Isolated Pneumatosis	None	None
Stage I (Suspect)	Normal Intestinal dilation Ileus	↑ Abdominal girth Abdominal distention Presence of emesis (bilious or non-bilious) Visible grossly bloody stool	Apnea Irritability HR instability Change in respiratory support
Stage II (Definite)	Intestinal dilation Ileus Pneumatosis intestinalis Portal venous gas	Signs from Stage I Abdominal tenderness Abdominal cellulitis	Signs from Stage I Mild acidosis/↑ Lactate Thrombocytopenia
Stage III (Advanced)	Same as Stage II Pneumoperitoneum	Signs from Stage II Signs of Peritonitis Marked tenderness Abdominal distention	Signs from Stage II Hemodynamic instability Metabolic acidosis Respiratory acidosis Mechanical ventilation probable

Intervention
may change if patient moves between stages

	Radiographic	NPO/Feeding	Antibiotics see medication chart for dose & duration	Surgical
Isolated Pneumatosis	KUB (2view) q 12hr x 48 hrs and/or change in clinical status	Consider NPO 24-48 hrs LIS with Anderson tube if NPO	None	None
Stage I (Suspect)	KUB (2view) q 12hr x 48 hrs and/or change in clinical status	NPO LIS with Anderson tube when NPO Maintain fluid status Reassess in 48hrs	Piperacillin/ tazobactam	Call if not resolved in 48hrs
Stage II (Definite)	KUB (2view) q 12hr x 48 hrs then daily until KUB normalizes	NPO LIS with Anderson tube when NPO Start TPN	Piperacillin/ tazobactam **+/-** Vancomycin	Consult Surgery
Stage III (Advanced)	KUB (2view) q 12hr x 48 hrs then daily until KUB normalizes	NPO LIS with Anderson tube when NPO Start TPN	Piperacillin/ tazobactam **+** Vancomycin Consult ID	Consult Surgery - likely surgical intervention

Feeding Plan - start 24 hrs after KUB is normalized & antibiotics have been completed

	Start	Advance	TPN	Fortification	Oral Medications	Guideline Completed
Stage I (Suspect)	Initiate feeds of BM or Formula 20 Cal/ounce at 30 mL/kg/day NG/NJ/PO	Advance by 30mL/kg/day as tolerated to a goal of 150mL/kg/day May transition to bolus as appropriate	Do not wean TPN until enteral feeds reach 80 mL/kg/day (half of goal). Then wean mL:mL with each increase in feed	24 hrs after full volume feeds reached, add Fortification to reach 22 Cal/ounce*	Oral medications not used until feeds reach 100 mL/kg/day**	Tolerating full volume feeds x 24hrs
Stage II & III Initiate/advance feeds per General Surgery	Initiate feeds of BM or Formula 20 Cal/ounce at 20 mL/kg/day NG/NJ/PO	Advance by 20mL/kg/day as tolerated to a goal of 150mL/kg/day May transition to bolus as appropriate	Do not wean TPN until enteral feeds reach 80 mL/kg/day (half of goal). Then wean mL:mL with each increase in feed	24 hrs after full volume feeds reached, add fortification to reach 22 Cal/ounce *	Oral medications not used until feeds reach 100 mL/kg/day**	Tolerating full volume feeds x 24hrs

* Patients who remain in the hospital on 22 Cal/ounce for 1 week can be advance to 24 Cal/ounce while in the hospital

** Only oral meds that can be given are captopril & spironolactone

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Empiric Treatment for the Cardiac Patient with Necrotizing Enterocolitis (NEC)

Indicaton	Antibiotic	Dose & Schedule*	Duration
Stage I NEC (Suspect)	Piperacillin/tazobactam (Zosyn)	100mg/kg q 8hr	48 hrs or determined by patient condition and clinician judgement
Stage II NEC (Definite)	Piperacillin/tazobactam (Zosyn) +/-	100mg/kg q 8hr	4 days from onset
	Vancomycin [1]	Premature (<2kg) 15mg/kg q 24hr Fullterm (<4wks) 15mg/kg q 12hr Fullterm (≥4wks) 15mg/kg q 8hr Any age, ≤14 days post-bypass 10mg/kg q 12hr	Vancomycin should be discontinued if no Gram positive organisms identified on culture at 48 hs
Stage III NEC (Advanced)	Piperacillin/tazobactam (Zosyn) +	100mg/kg q 8hr	10 -14 days
	Vancomycin	Premature (<2kg) 15mg/kg q 24hr Fullterm (<4wks) 15mg/kg q 12hr Fullterm (≥4wks) 15mg/kg q 8hr Any age, ≤14 days post-bypass 10mg/kg q 12hr	Vancomycin should be discontinued if no Gram positive organisms identified on culture at 48 hrs

*Vancomycin levels and dosing adjustments to be managed by Pharmacokinetics Service

[1] Vancomyin recommended in NEC Stage II if Gram positive organism identified on culture, hemodynamic instability, and/ or clincal sepsis

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