

---

---

---

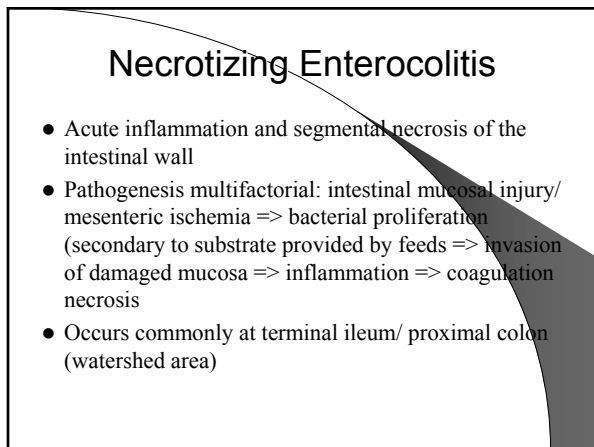
---

---

---

---

---



---

---

---

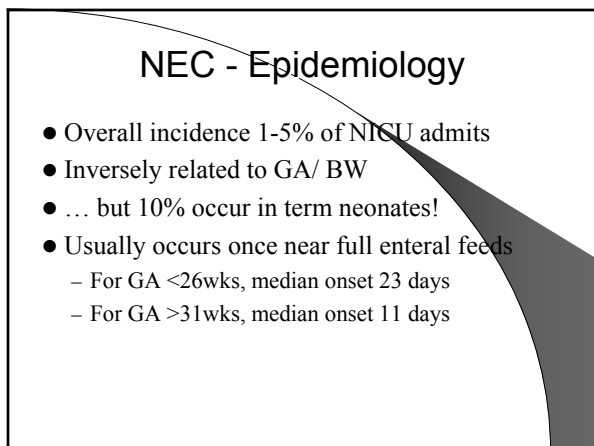
---

---

---

---

---



---

---

---

---

---

---

---

---

## NEC – Risk factors

- Prematurity
- Perinatal asphyxia
- Maternal cocaine
- Dehydration/shock
- RDS
- Umbilical lines
- PDA (diastolic steal)
- CHD
- Polycythemia/ anemia
- Thrombocytosis
- Exchange transfusion
- GI anomalies
- Non- BM formula
- NJ feeds
- Hypertonic formula
- Rapid feed advance
- Colonization with necrogenic bacteria

---

---

---

---

---

---

---

---

## NEC – Clinical signs

- | Systemic              | Enteric                               |
|-----------------------|---------------------------------------|
| ● RDS, A&B's          | ● Increased residuals                 |
| ● Lethargy            | ● Abdominal distension                |
| ● Temp instability    | ● Vomiting (bilious)                  |
| ● Hypotension (shock) | ● Absent bowel sounds                 |
| ● Acidosis            | ● Abd wall erythema/ induration/ mass |
| ● Oliguria            | ● Ascites                             |
| ● DIC                 | ● Gross blood in stool                |

---

---

---

---

---

---

---

---

## Necrotizing Enterocolitis clinical presentation



---

---

---

---

---

---

---

---

## NEC – Lab/ Xray findings

### Laboratory:

- ↓plts (DIC)
- ↑ or ↓ WBC
- Metabolic acidosis
- Hyponatremia
- Heme + stool
- Reducing substances (carbohydrates) in stool

### Radiology:

- pneumatosis intestinalis (air in subserosal wall)
- Ileus
- fixed/ thickened bowel loops
- Air in hepatic portal vein
- pneumoperitoneum

---

---

---

---

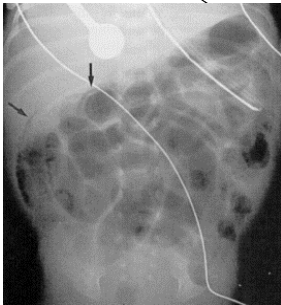
---

---

---

---

## NEC – pneumatosis intestinalis



---

---

---

---

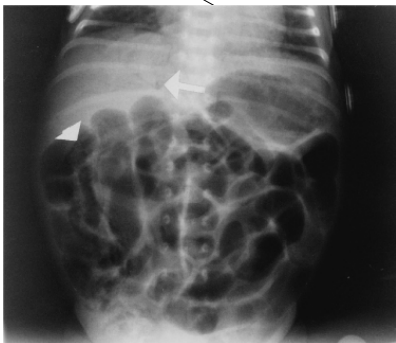
---

---

---

---

## NEC- portal venous air



---

---

---

---

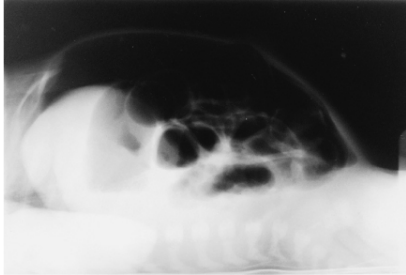
---

---

---

---

NEC- perforation



---

---

---

---

---

---

---

---

NEC – “football sign”



---

---

---

---

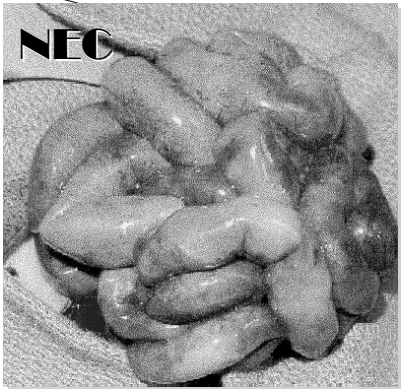
---

---

---

---

NEC



---

---

---

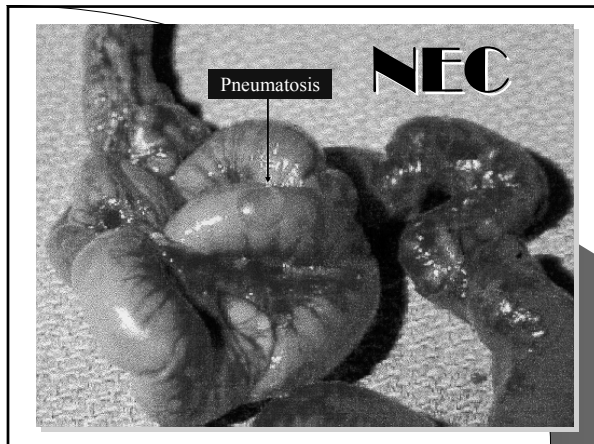
---

---

---

---

---




---

---

---

---

---

---

---

---

**NEC – Staging (Bell et al)**

- Stage I (suspected NEC): temp instability, A&B's, lethargy, increased residuals, mild abdominal distension, emesis, heme + stool, xray n/ or mild ileus
- Stage II (definite/ medical NEC): Stage I AND absent bowel sounds, mild metabolic acidosis, thrombocytopenia, abdominal cellulitis, Xray ileus and pneumatosis
- Stage III (advanced/ surgical NEC): Stage II AND shock, severe acidosis, DIC, neutropenia, peritonitis/ascites, pneumoperitoneum

---

---

---

---

---

---

---

---

**NEC - management**

● NPO/ bowel rest	● Frequent labs (CBC, BMP, ABG)
● Gastric drainage (sump to LIS)	● Mechanical ventilation
● Septic w/u	● Pressor support
● Broad spectrum abx (ampicillin, gentamicin, flagyl)	● Remove umbilical lines!
● Serial abdominal exam/ xray (2 views) every 6-8 hrs initially	● Paracentesis
	● Local peritoneal drainage (for < 1000g)
	● Surgery (+/- 2 <sup>nd</sup> look @ 24-72 hrs)

---

---

---

---

---

---

---

---

### NEC - prevention

- Early reports of delayed feedings leading to decreased NEC not substantiated by prospective trials
- Mixed data on trophic/ dilute feeds, speed of advancing feeds...but MAX 20cc/kg/day
- Mixed data on antenatal steroids but lung benefits make standard of care
- Mixed data on oral immunoglobulins – metanalysis does not support routine use
- Preliminary studies with L-arginine (NO precursor) and L-carnitine (anti-oxidant) supplementation promising

---

---

---

---

---

---

---

---

### NEC – prevention (cont)

- Oral antibiotics may reduce incidence of NEC and related deaths but adverse effects, development of resistance preclude routine use
- Mixed studies regarding indomethacin rx for PDA and increased NEC risk
- Formula fed infants with 6-10x NEC risk compared to breastfed (multifactorial: Igs, IL-10, erythropoetin, epidermal growth factor, platelet activating factor (PAF)- acetylhydrolase)
- Promising animal and preliminary studies regarding benefits of probiotics

---

---

---

---

---

---

---

---

### NEC - refeeding

- To start...
  - after bowel rest x 7-14 days
  - Normalized AXR
  - Clinically stable
- Formula or BM (preferred), may require more elemental formula
- Strength/ volume GRADUALLY increased
- For patients w/ ostomy- watch output (should be < 30-40% of feeds)

---

---

---

---

---

---

---

---

## NEC - Outcome

- Mortality 30-40% (up to 50% for Stage III)
- Strictures 15-35% (may develop even after 6 months after episode)
- Adhesions/ bowel obstruction in 5% of surgical patients
- Short gut syndrome (>50% of bowel removed) also associated with malabsorption (fat, B12, bile salts) and TPN complications (cholestasis occurs in 7-40% if on > 2mo, line sepsis)

---

---

---

---

---

---

---

---

## Short Bowel Syndrome

### Two Causes:

- Congenital
- Surgical resection

### Treatment:

- Supportive care
- TPN
- Enteral alimentation with semielemental formula
- Continuous infusion
- Supplemental Na<sup>+</sup>, K<sup>+</sup>, Bicarb, Ca<sup>++</sup>, Mg<sup>++</sup>

---

---

---

---

---

---

---

---

## Short Bowel Syndrome

### Treatment:

- Fat-soluble vitamins
- Vitamin B<sub>12</sub>
- Rx of severe diarrhea:
  - Cholestyramine
  - Non-absorbable antibiotics
- Correction of blind loops and stagnant sections of the bowel

---

---

---

---

---

---

---

---

# Short Bowel Syndrome

Bowel transplant  
Bowel & liver  
transplant

Types of Failure	Examples
Changes in Small Bowel Structure	<ul style="list-style-type: none"><li>• Necrotizing Enterocolitis</li><li>• Microvillus Atrophy</li><li>• Pseudoobstruction</li><li>• Crohn's Disease</li><li>• Gardner's Syndrome</li><li>• Radiation Enteritis</li><li>• Unresectable tumour</li><li>• Intestinal Atresia</li><li>• Gastroschisis</li></ul>
Blood Supply to the Small Bowel	<ul style="list-style-type: none"><li>• Superior Mesenteric Artery Thrombosis</li><li>• Volvulus</li><li>• Trauma</li><li>• Superior Mesenteric Vein Thrombosis</li></ul>
Other	<ul style="list-style-type: none"><li>• Severe secretory diarrhea</li><li>• Malabsorption Syndrome</li></ul>

---

---

---

---

---

---

---

---