

# NEC



cathy e. shin  
childrens hospital los angeles  
department of surgery  
university of southern california  
keck school of medicine

# Necrotizing enterocolitis (NEC)

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- the most common and most lethal disease affecting the GI tract of the premature infant
  - is characterized by intestinal barrier disruption, leading to intestinal necrosis, multisystem organ failure and death
- affects 7–12% of preterm infants weighing less than 1500 g
- the frequency of disease appears to be either stable or rising in several studies
- mortality ranges from 10%-70%
  - approaches 100% for pan-necrosis

- In its early stages, NEC is difficult to diagnose
- initial presentation includes :
  - temperature instability
  - apnea
  - bradycardia
  - lethargy
  - mild feeding intolerance
  - which are symptoms that are shared with many other septic processes
- no effective cure for NEC, and the overall survival rate has not changed in the past 30 years

- The current treatment regimen for infants with NEC includes:
  - cardiorespiratory support
  - nasogastric decompression
  - broad-spectrum antibiotics
  - NPO
- Surgical intervention is required in up to 50% of the cases
  - when NEC fails to improve with medical management
  - setting of pneumoperitoneum

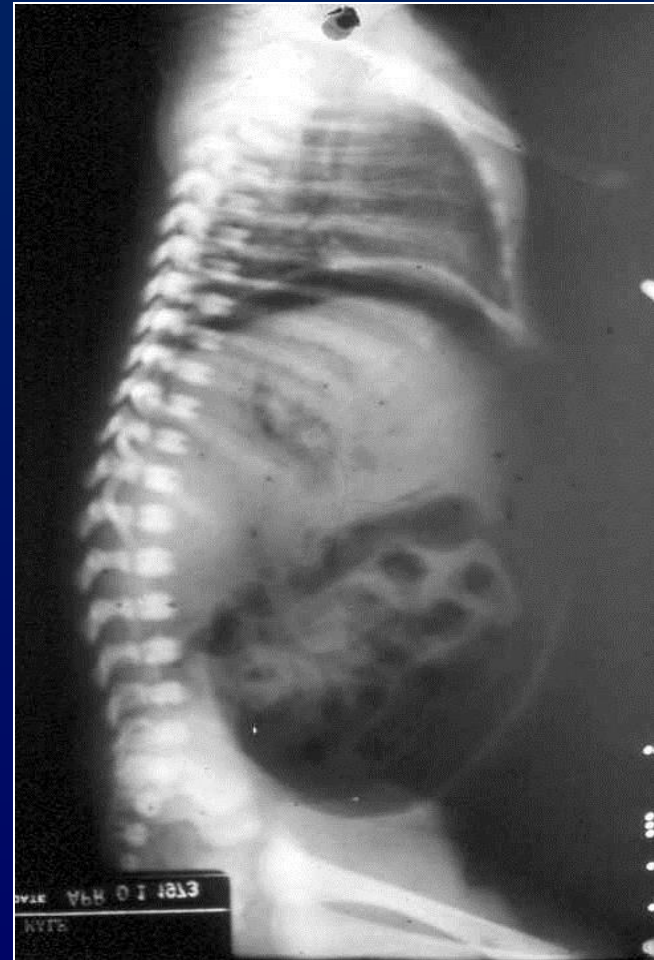
# Case Presentation

- 15 d ex 29 weeks
- birthweight 1050 gm
- NICU course:
  - Respiratory Distress Syndrome
  - Indomethacin for PDA
- abdominal distention
- high residuals
- blood per rectum after initiation of enteral feedings



# Case Presentation: Work-up

- Labs:
  - WBC: 3.2
  - Plt: 36,000
  - pH: 7.31
  - BE: -6.2
- Abd X-ray:
  - Portal Venous Gas
  - Pneumatosis
  - Pneumoperitoneum



# Case Presentation: Management

- Fluid resuscitation
- IV antibiotics
- Laparotomy
  - Diffuse patchy necrosis (pan-necrosis); perforation at terminal ileum
  - Necrotic segment resected with creation of jejunostomy and mucous fistula



# NEC: Risk Factors

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- Prematurity
- Enteral alimentation
- GI microbial flora
- Respiratory insufficiency
- Congenital heart disease
- Medications (Indomethacin)
- Maternal cocaine use



# NEC: Bell Stage Classification

<u>Stage</u>	<u>Clinical Findings</u>	<u>X-ray Findings</u>
<b>I. Suspected NEC</b>	<b>mild abd distention poor feeding vomiting</b>	<b>mild ileus</b>
<b>II. Definite NEC</b>	<b>above + mild abd distention GI bleeding</b>	<b>significant ileus pneumatosis PVG</b>
<b>III. Advanced NEC</b>	<b>above + deterioration of VS septic shock</b>	<b>above + pneumoperitoneum fixed loop</b>

# NEC: Initial Management

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- NPO
- Orogastric decompression
- Fluid resuscitation
- IV antibiotics
- Serial examinations
- AXR (2 views) q 6 – 8h

**OBJECTIVE:** The optimal treatment of necrotizing enterocolitis (NEC) is a common challenge for pediatric surgeons. Although many studies have evaluated prevention and medical therapy for NEC, few guidelines for surgical care exist.

**METHODS:** Data were compiled from a search of PubMed, OVID, the Cochrane Library database, and Web of Science from January 1985 until December 2011.

**RESULTS:** The Cochrane Reviews support the use of prophylactic probiotics in preterm infants less than 2500 grams to reduce the incidence of NEC, as well as the use of human breast milk rather than formula when possible. There is no clear evidence to support delayed initiation or slow advancement of feeds. For surgical treatment of NEC with perforation, there is no clear support of peritoneal drainage versus laparotomy. Similarly, there is a lack of evidence comparing enterostomy versus primary anastomosis after resection at laparotomy. There are little data to determine the length of treatment with antibiotics to prevent recurrence of NEC.

**CONCLUSION:** Based on available evidence, **probiotics** are advised to decrease the incidence of NEC, and **human milk** should be used when possible. The other reviewed questions are clinically relevant, but there is a lack of evidence-based data to support definitive recommendations. These areas of NEC treatment would benefit from future investigation.

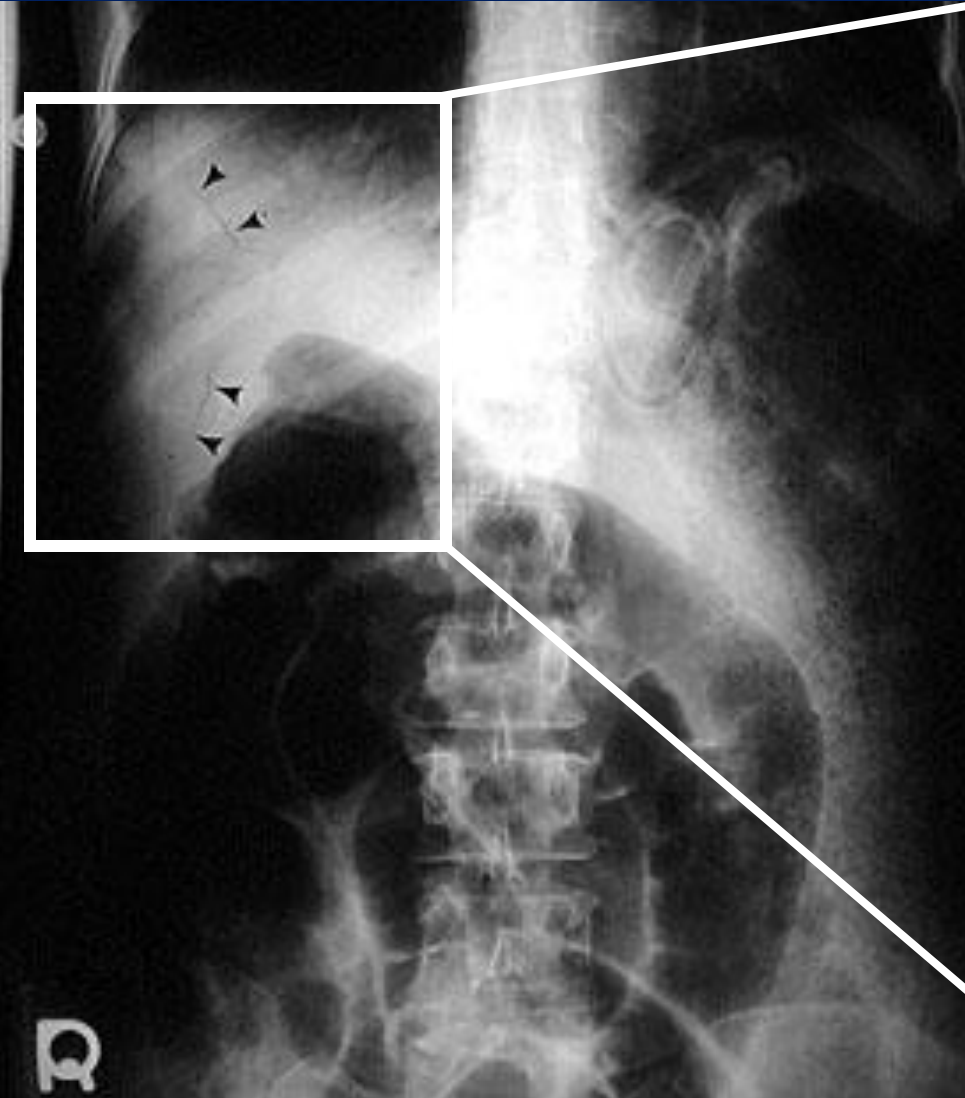
# Indications to Operate

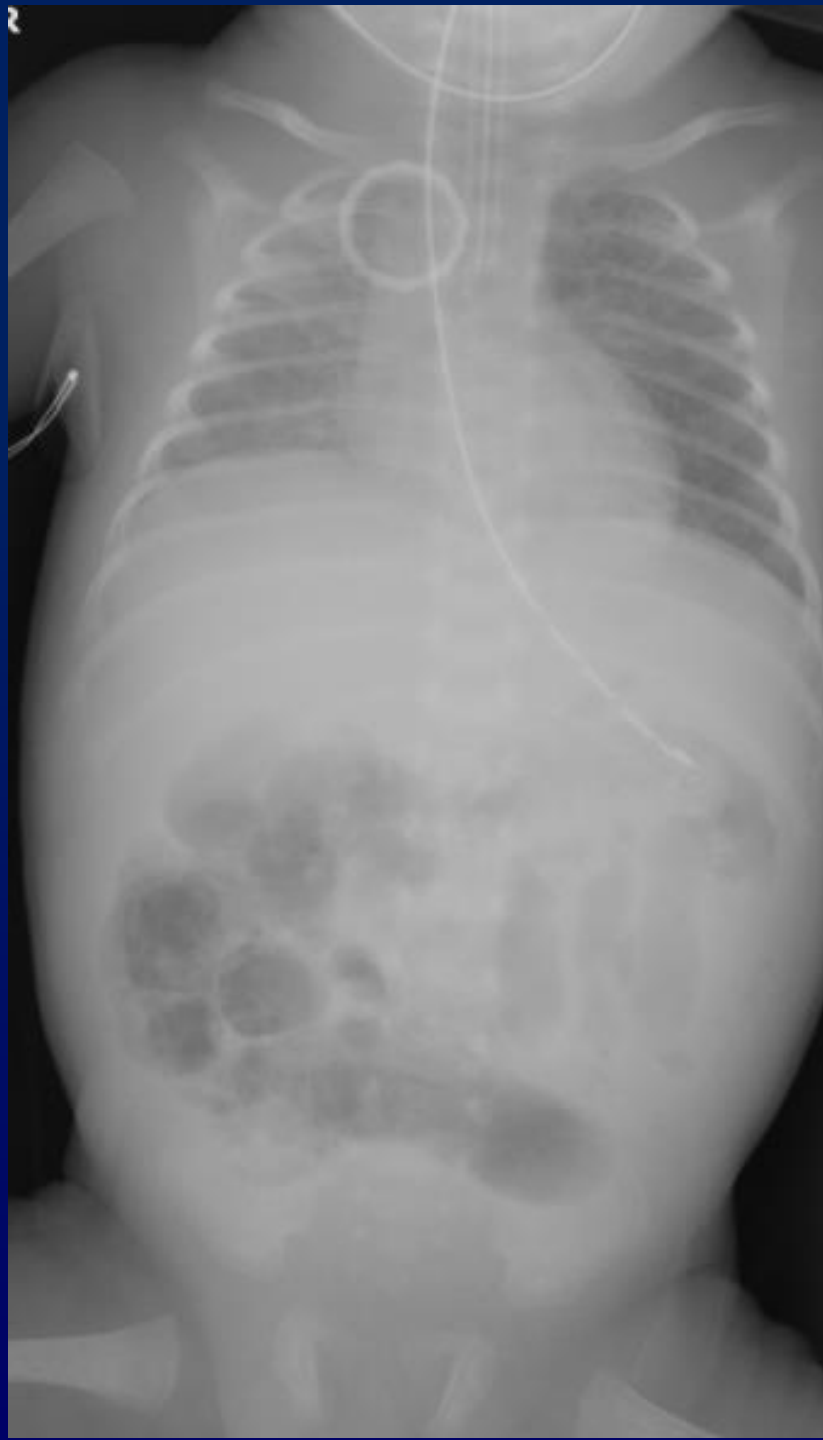
- Absolute:
  - Perforation
- Relative:
  - Portal venous gas
  - Fixed loop
  - Clinical deterioration despite maximal medical support (oliguria, worsening labs/gas/vent support)
  - Compartment syndrome
  - Team approach

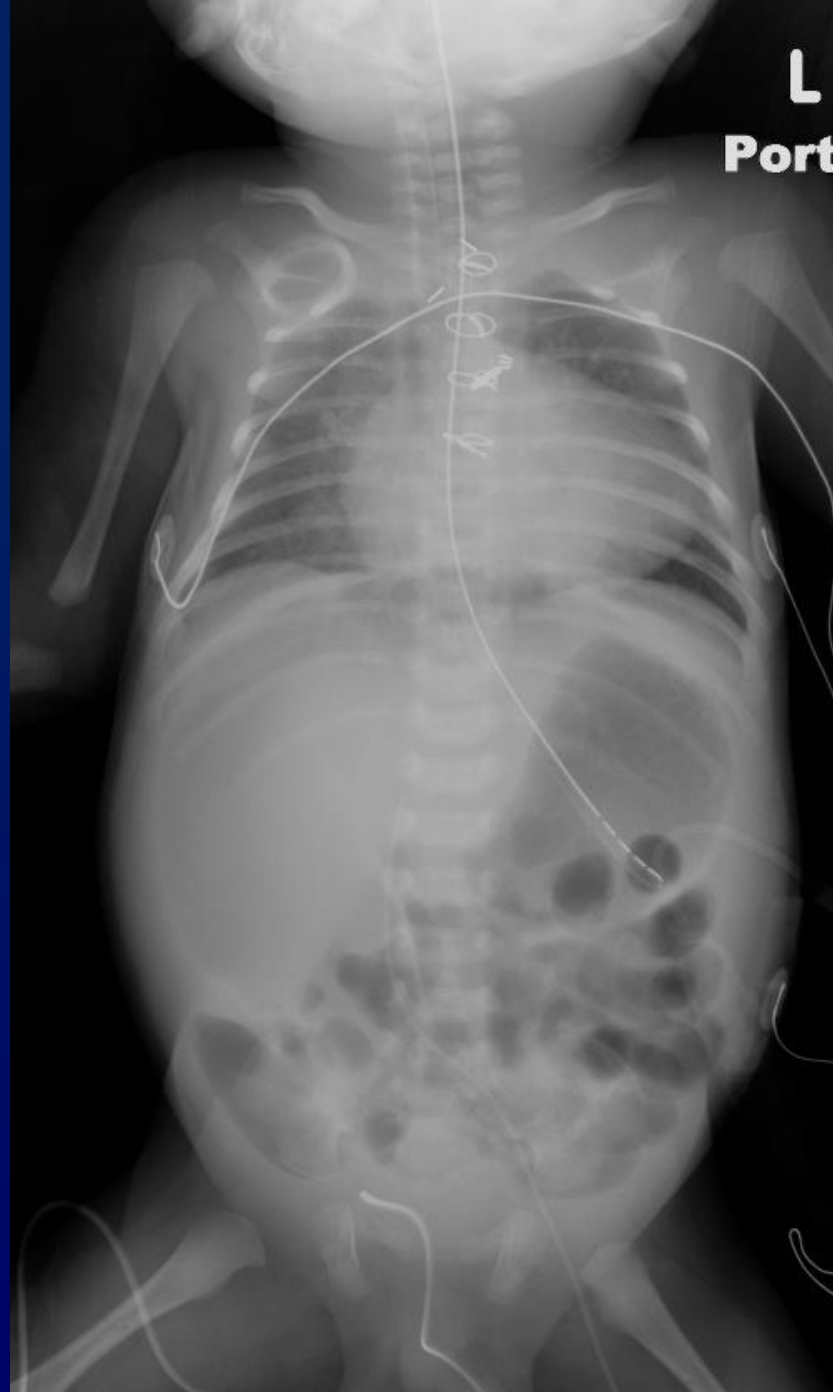
# Abdominal Wall Cellulitis in NEC



# Portal Venous Gas in NEC

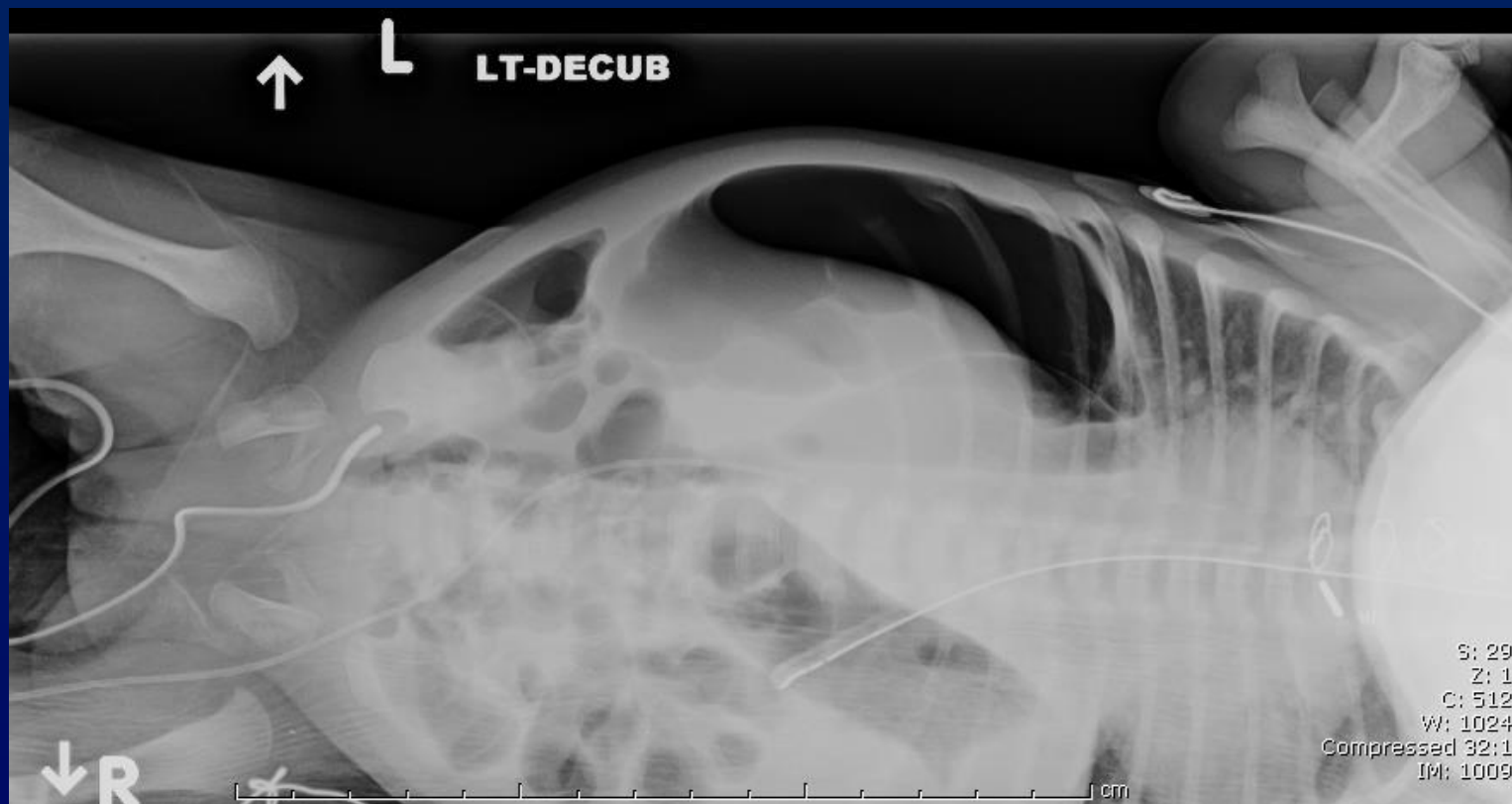






**Free air?**







# Surgical Approach

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- Management controversial
  - Increased popularity of Peritoneal Drainage
  - Laparotomy is still the gold standard
- Depends on extent of bowel involvement at laparotomy:
  - Focal perforation
  - Pan-necrosis

# Surgical Options

## Laparotomy

1. Resection with enterostomy
2. Resection with primary anastomosis
3. Proximal enterostomy
4. “Clip and drop”
5. Closure without resection or drainage

## Primary Peritoneal Drainage

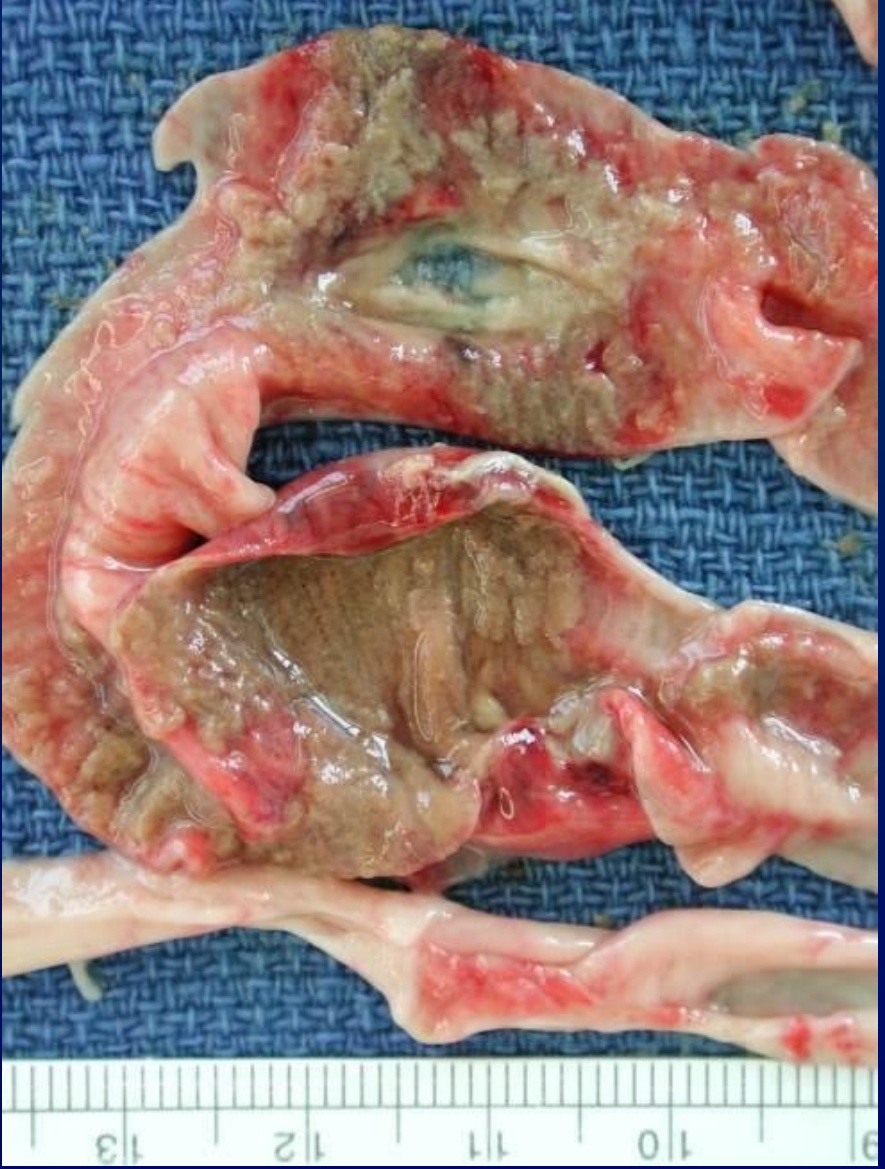
1. Drainage as definitive therapy
2. Drainage with stabilization and subsequent laparotomy

# NEC: Operative Management

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- **Segmental Necrosis:**
  1. Resection + Stoma
  2. Resection + Primary Anastomosis
- **Pan-Necrosis:**
  1. Proximal intestinal diversion with or without limited segmental resection
  2. Peritoneal drainage alone
  3. Peritoneal drainage + delayed laparotomy





# Pan-involvement

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## How much to resect?

- Options include:
  - resection with multiple ostomies
  - “clip and drop back technique”
  - proximal diversion alone with or without second look
- Goal is to limit extent of bowel resection and avoid short-gut syndrome

# Outcomes

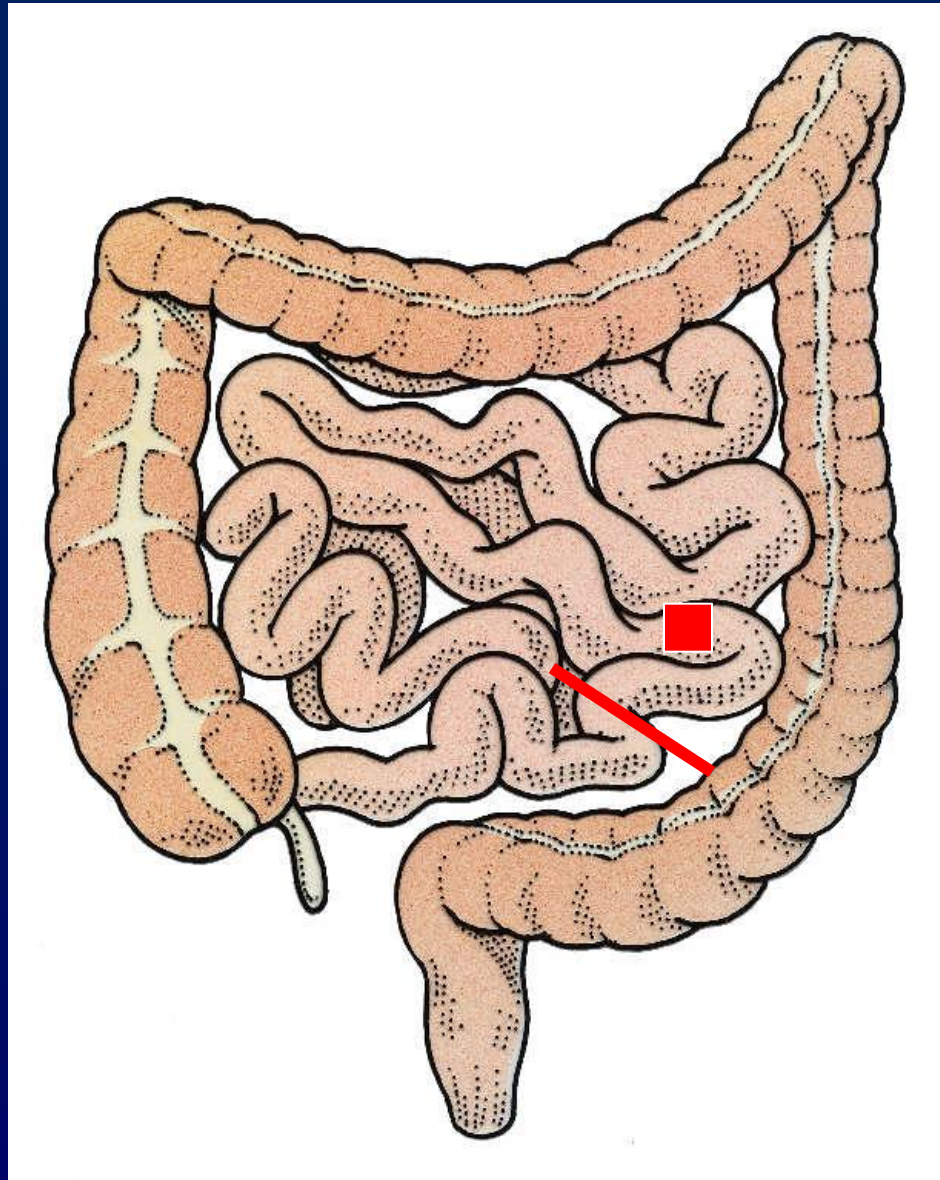
- Mortality 15 – 30%
- Surgical mortality 20 – 50% (used to be 70%)



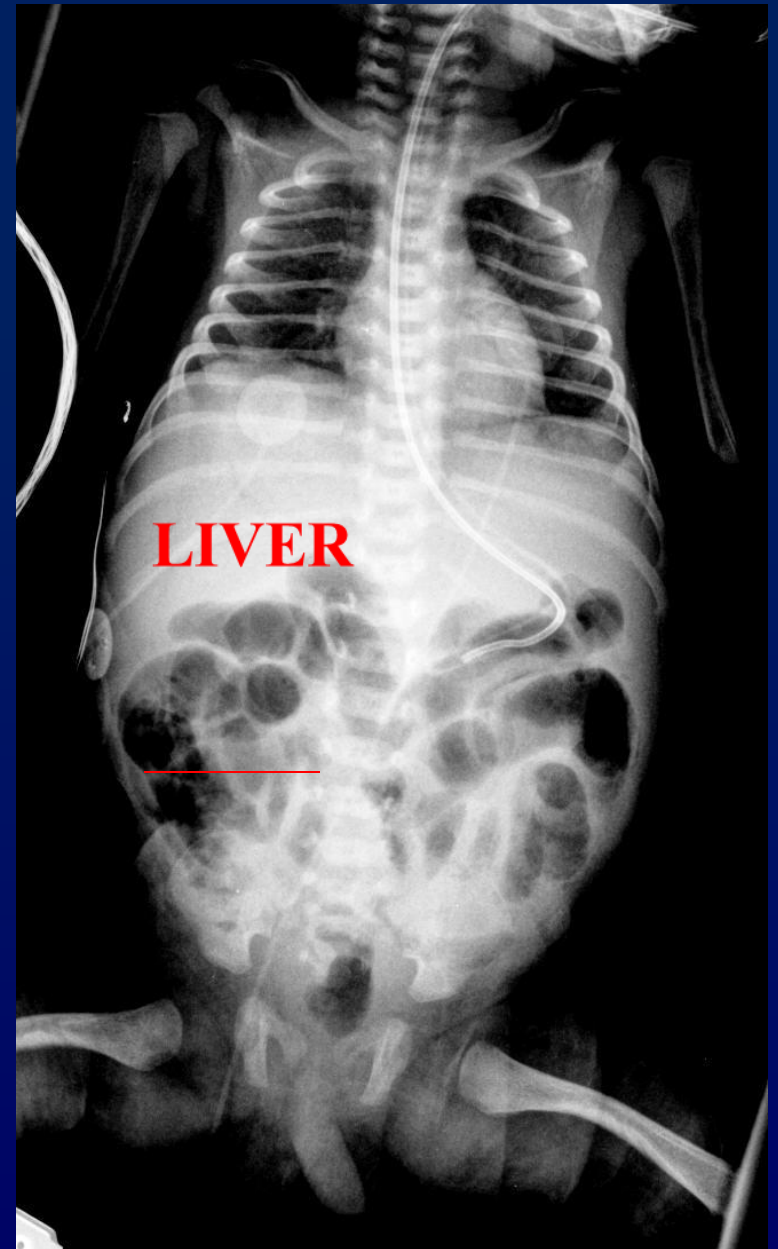
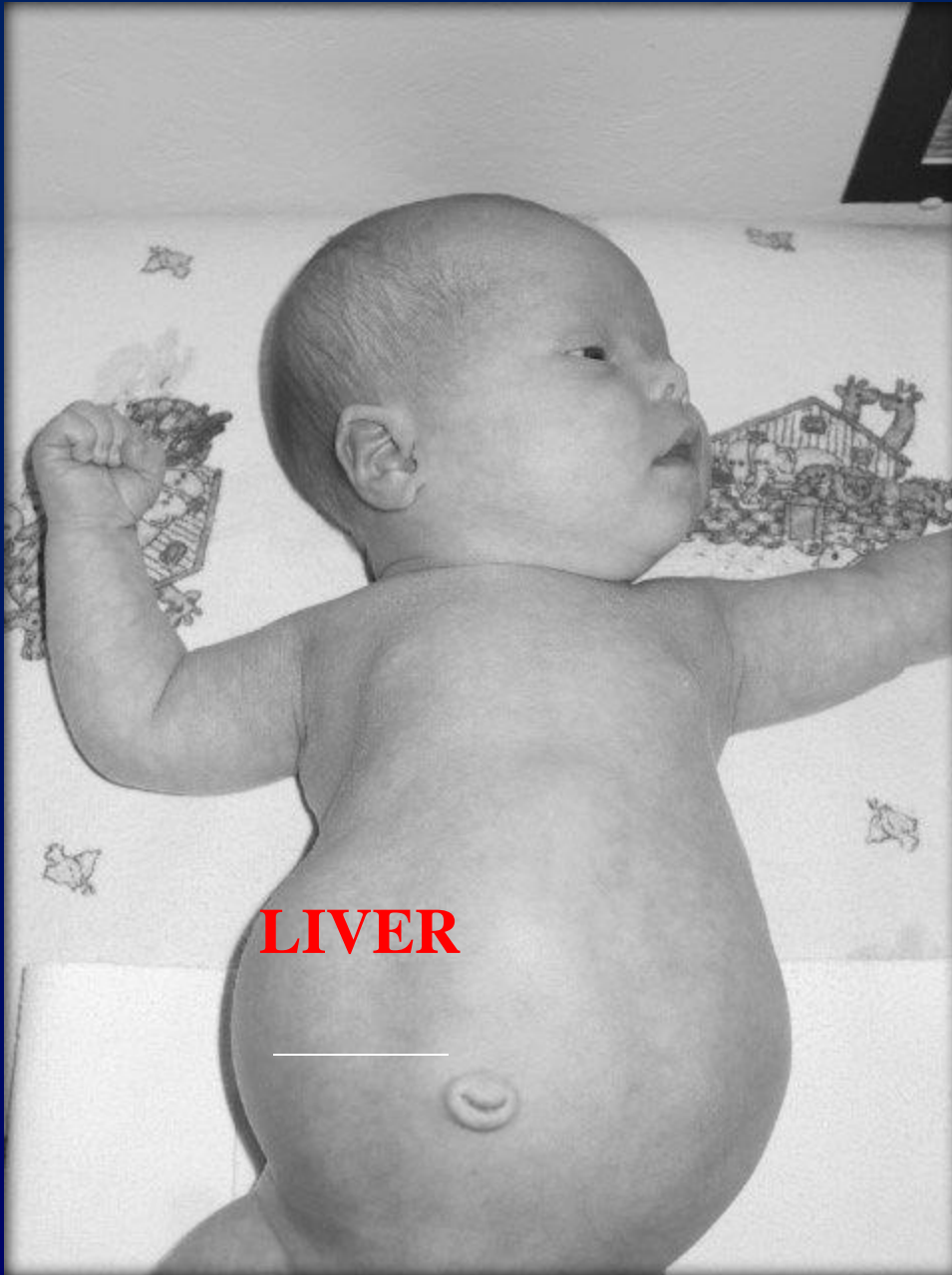
# Stoma





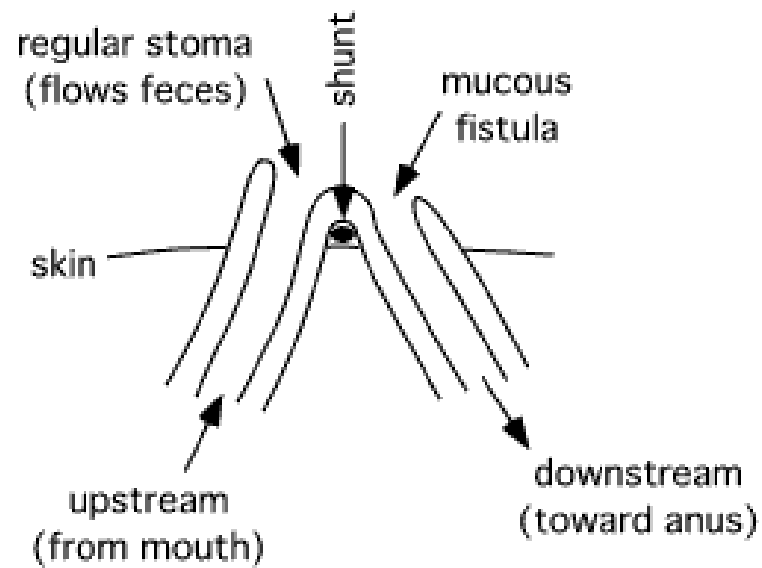




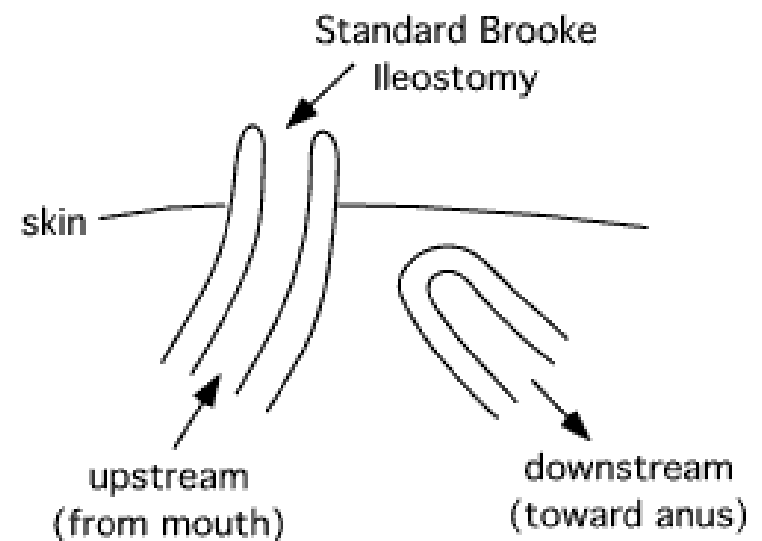




### Loop Ileostomy



### End Ileostomy



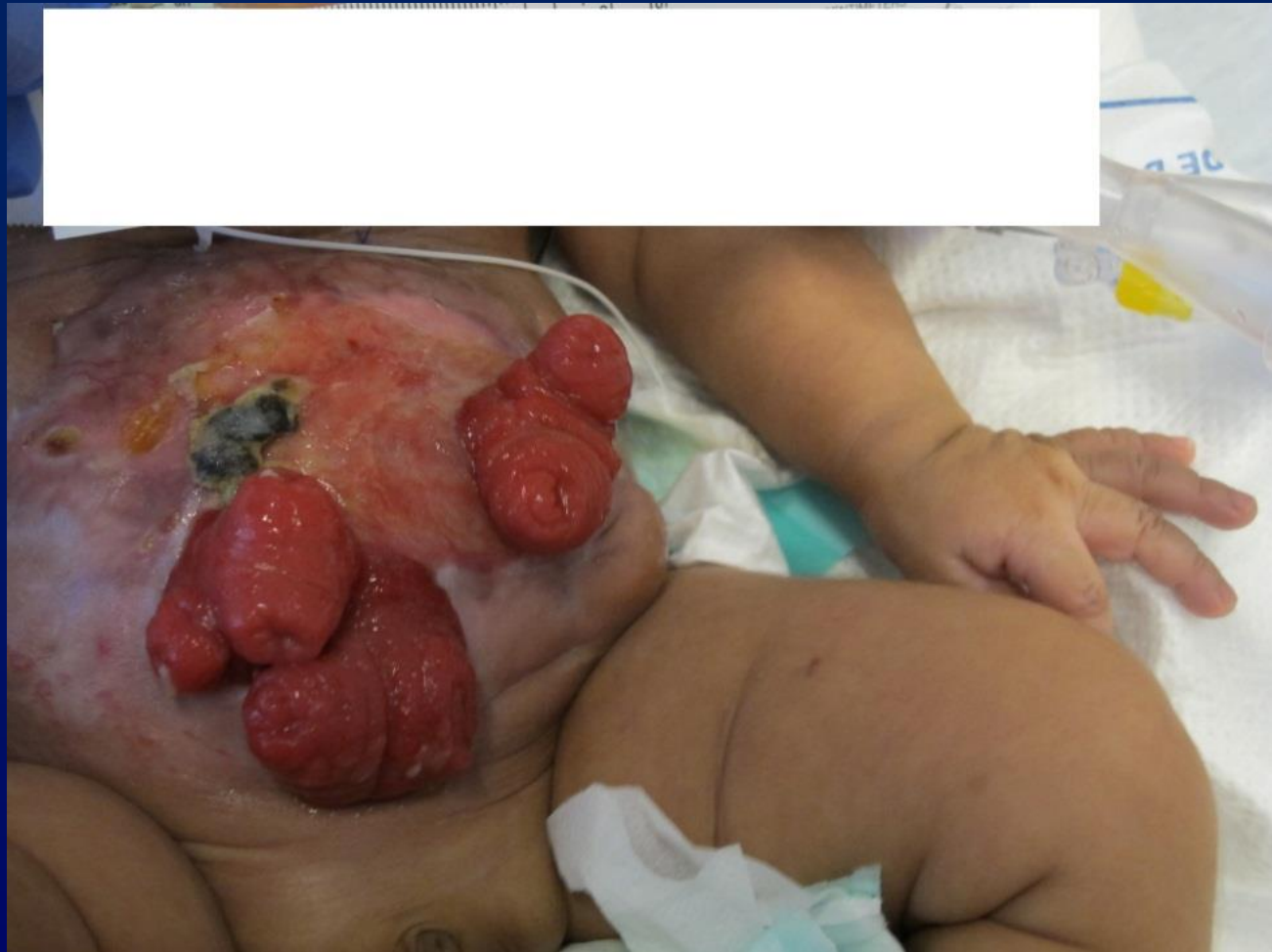
# Neonatal Stomas

- Stomas may be placed within the laparotomy incision to preserve as much intestinal length as possible and leave minimal scarring
- An infant's pouch needs to be able to accommodate a greater amount of gas than that of an adult because of air swallowing that occurs during sucking
- Flexibility is an important consideration when choosing a preemie pouch
- By 32 weeks' gestation, barrier function of the skin has been found to be compatible with that of adult
- Pouch wear time for the preterm infant will not be comparable with that for an older child or adult

- Very fragile and labile
- Skin incredibly thin and tears easily but also heals well vs elderly skin









# Prolapse



# Fistulas





# Hernias



# Dumping

- When rate /or concentration of feeds exceeds the intestines ability to absorb it
- Ph drops and carbohydrate is spilled
- Volume is hard to measure as peristomal skin and muscle motility also precludes good seal and leakage is usually underestimated

# Consequences

- Barrier erosion and denudation if not ulceration of skin
- Hernias affect seal as does prolapse and lacerations of stoma base or sides become more common



# Nooks and crannies and skin folds for days





# Take your time on assessment



**Looking good here**



**Mucus and urine may emanate from the downstream end and**









03/27/2014

# 13-day old, 1410g neonate

- 30-week gestation twin
- Necrotizing enterocolitis x 4 days with perforation
- SBR, ileostomy and mucous fistula
- Flush stoma
- Budded mucous fistula
- Nurses were unable to pouch the patient at all using Ilex ointment and gauze dressings
- The child was experiencing significant peristomal skin breakdown, largely due to an inability to maintain pouch seal. Inconsistent care from staff was also proving problematic, all of which resulted in significant pain for patient.



- The general causes for peristomal breakdown
  - Fungal rash
  - Irritant contact dermatitis
  - Staph infection
  - Allergic contact dermatitis
- In this case, skin breakdown was as a result of irritant dermatitis as skin damage was occurring due to a failure of the pouch seal that allowed prolonged contact with urine or stool.





- The second goal of care plan
- We found that the best course of action was to apply pectin-based powder, alcohol free skin sealant and a convex pouching system with a belt.





# Conclusions

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1. More research is needed on NEC
2. Surgical management is important, but aggressive resuscitation and antibiotic Rx are essential
3. Good ostomy care