

The role of imaging in necrotizing enterocolitis (for neonatologists and pediatric surgeons)

Please answer all questions according to current praxis in your department rather than to an ideal situation, except when an opinion is explicitly asked for. Answers will be handled confidentially. For administrative reasons, however, you will be asked for the name and location of your hospital. Important: use the blue button at the bottom of the page to proceed through the questionnaire and eventually submit your response so that you get a message at the end that your answers have been saved, otherwise they will not be included in the survey.

Background information

At what hospital do you work?

Please state name and location of the hospital. This question is mandatory for administrative reasons only and will not be used for identification.

How big is the neonatal intensive care unit (NICU) of your hospital?

Please state approximate number of beds

What is your field of expertise

- Neonatology
- Pediatric surgery

Diagnostic considerations

What differential diagnoses do you usually consider in patients with suspected NEC?

	always	sometimes	no
Paralytic ileus in sepsis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feeding intolerance of the premature	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spontaneous intestinal perforation (SIP)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Viral enteritis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gastrointestinal malformations including malrotation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hirschsprung's disease	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ileus from meconium or other obstruction	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Cow's milk protein allergy	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other. Please specify below.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other:

What aspects are considered in the differential diagnosis?

Please indicate the importance of each aspect (great, some or none)

	great	some	none	I don't know
Degree of prematurity	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Age of onset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Feed volumes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Radiographic findings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ultrasonographic findings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Laboratory findings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Clinical picture"	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other. Please specify below.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other:

Do you use any kind of classification or staging of NEC?

	always	sometimes	no
Clinical appreciation of suspected, definite medical, or surgical NEC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bell's criteria (or modified Bell's criteria)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Gordon's classification	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other staging or classification. Please describe below.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other:

The role of imaging

How do you use imaging in the management of suspected or definite NEC?

always sometimes no

- For confirmation of the diagnosis
- For monitoring to stay ahead of the clinical course
- For guidance when deciding on surgery
- For guidance on when to resume feedings
- Other use. Please describe below.

Other use:

What modality is used?

AR = Abdominal Radiography; US = Ultrasound

always sometimes no

- AR as first choice
- US as first choice
- AR if US is not available
- US if AR is not conclusive
- AR and US in combination
- Other routine. Please specify below

Other routine:

How frequently are patients with confirmed or suspected NEC examined with radiological methods?

Often Sometimes Rarely

- More than once every 24 hours
- About once every 24 hours
- Less than once every 24 hours

How do you decide on the frequency of radiological exams?

always sometimes no

- According to a fixed schedule
- According to an individual plan for each infant
- From exam to exam depending on the result and clinical course
- Other routine. Please specify below.

Other routine:

always sometimes no

- Is radiation a concern

Who decides what modality to use?

- | | always | sometimes | no |
|--|-----------------------|-----------------------|-----------------------|
| Clinician (neonatologist or pediatric surgeon) | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Radiologist | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Clinician and Radiologist by consent | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Other routine. Please specify below. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Other routine:

Repeated imaging

The word "examined" in the questions below refers only to imaging techniques, not clinical examination or chemistry.

- | | yes | sometimes | no | I don't know |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| If NEC is not confirmed, the infant is usually examined only once | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| If NEC is not confirmed, the infant is usually examined again with the same method | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| If NEC is not confirmed, the infant is usually examined again with a different method | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| If NEC is confirmed, the infant is usually examined only once | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| If NEC is confirmed, the infant is usually examined again with the same method | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| If NEC is confirmed, the infant is usually examined again with a different method | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

What is considered an indication for surgery?

AR=Abdominal radiograph; US=Ultrasound; PVG=Portal Venous Gas

- | | definitely | sometimes | no |
|--|-----------------------|-----------------------|-----------------------|
| Pneumoperitoneum on AR | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Pneumoperitoneum in US | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Portal venous gas on AR | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Portal venous gas in US | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| "Fixed/persistent loop" on sequential AR | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Turbid or localized peritoneal fluid in US | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Clinical deterioration despite medical therapy | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Other indication. Please specify below. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Other indication:

Abdominal Radiography

What pictures are included in AR in NEC/suspected NEC at your department?

Vertical beam is the ordinary frontal projection with the patient in supine position. Is it done whenever NEC is suspected or are there exceptions? Horizontal beam images, used to detect free gas in the abdominal cavity, can be obtained with the infant supine, which produces a lateral projection, or in the left decubitus position, i.e. lying on its left side, producing a frontal projection. The questions below regard both if and when horizontal beam images are used and the preferred method for obtaining them.

	in all patients	in selected patients	no	I don't know
Vertical beam	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Horizontal beam (any position) first 24-48 hours	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Horizontal beam (any position) after 48 hours	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Horizontal beam, supine position	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Horizontal beam, left decubitus position	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other routine. Please describe below.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other routine:

Do you read the radiographs yourself

- always
- sometimes
- no

What is evaluated in the AR in suspected NEC at your hospital?

Please indicate the importance of each finding (great, some or none).

	great	some	none	don't know
Intestinal dilatation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pattern of gas distribution	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Separation of intestinal loops	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Fixed/persistent loop" on sequential radiographs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pneumatosis intestinalis/intramural gas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Portal venous gas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pneumoperitoneum/free gas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other signs. Please specify below.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other signs:

Ultrasound

What do you think about abdominal ultrasound in NEC diagnostics?

	yes	sometimes	no	no opinion
Useful	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Readily available	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Time consuming	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Disturbs the infant	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Should be used more	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Comments:

When is ultrasound done?

AR=Abdominal Radiograph

	yes	sometimes	no
In any infant with suspected NEC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In mild cases with inconclusive AR	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
In severely ill infants with inconclusive AR/suspected but not verified perforation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For monitoring known NEC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other routine. Please specify below	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other routine:

What is evaluated with ultrasound in NEC/suspected NEC at your hospital?

If ultrasound is not used in NEC, please just indicate "no" on the first question and leave the rest blank.

	yes	no	I don't know
Ultrasound is used in NEC/suspected NEC	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Portal venous gas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pneumatosis intestinalis/intramural gas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pneumoperitoneum/free gas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Clear/anechoic fluid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Turbid/echoic fluid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Focal fluid collections	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Intestinal motility	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bowel thickening	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bowel thinning	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Bowel perfusion (with doppler)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

yes no I don't know

Mesenterical circulation (with doppler)

Other signs. Please specify below.

Other signs:

Do you and/or other colleagues at your department do ultrasound of head or abdomen yourselves?

PVG=Portal Venous Gas

all some no

Head

Full abdominal

Screening for PVG

Comment:

Do you get support from the radiology department with reevaluation of saved cine loops or pictures?

- Yes, cineloops
- Yes, pictures
- No
- Not applicable

Would it be a good idea for neonatologists and pediatric surgeons who do not perform abdominal ultrasound today, to learn it?

- Yes, full abdominal
- Yes, screening for PVG
- No
- No opinion

Concluding comments

What would you say is the role of imaging in the management of NEC and what should it be?

Important: Even if you chose not to comment on this question, please use the blue button below to submit your response. Otherwise your answers will not be included in the survey.

When you get a message that they have been saved, you can close the browser.

