

## **The role of imaging in necrotizing enterocolitis – radiologists’ version**

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. The 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 if you know it.

What is your field of expertise

- General radiology
- Pediatric radiology

## Diagnostic considerations

What differential diagnoses come to mind when you encounter a request for imaging with respect to NEC?

For considerations entirely left to the clinician, please choose the response option "no".

	<b>always</b>	<b>sometimes</b>	<b>no</b>
Paralytic ileus in sepsis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Spontaneous intestinal perforation (SIP)	<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"/>
Gastroenteritis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other. Please specify below.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other/comments:

Which clinical information do you consider relevant in order to evaluate the request and/or the study?

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

	<b>great</b>	<b>some</b>	<b>none</b>	<b>no opinion</b>
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"/>
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 aspect/comment:

Is any classification or staging of NEC used in the communication between radiologists and clinicians at your hospital?

	<b>always</b>	<b>sometimes</b>	<b>no</b>
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 is imaging used in the management of suspected or definite NEC?

	<b>always</b>	<b>sometimes</b>	<b>no</b>	<b>I don't know</b>
For confirmation of the diagnosis	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For monitoring to stay ahead of the clinical course	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For guidance when deciding on surgery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
For guidance on when to resume feedings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other use. Please describe below.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other use:

What modality is used

AR = Abdominal Radiography; US = Ultrasound

	<b>always</b>	<b>sometimes</b>	<b>no</b>
AR as first choice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
US as first choice	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
AR if US is not available	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
US if AR is not conclusive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
AR and US in combination	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Individualized approach	<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:

Who decides what modality to use?

	<b>always</b>	<b>sometimes</b>	<b>no</b>
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:

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

	<b>often</b>	<b>sometimes</b>	<b>rarely</b>	<b>I don't know</b>
More than once every 24 hours	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
About once every 24 hours	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Less than once every 24 hours	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

How is the frequency of radiological exams decided?

- |  | <b>always</b>         | <b>sometimes</b>      | <b>no</b>             |
|--|-----------------------|-----------------------|-----------------------|
| According to a fixed schedule. Please specify below. | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| According to an individual plan for each infant      | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| From exam to exam depending on the result            | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Other routine. Please specify below.                 | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Description of fixed schedule or other routine:

- |                        | <b>always</b>         | <b>sometimes</b>      | <b>no</b>             |
|------------------------|-----------------------|-----------------------|-----------------------|
| Is radiation a concern | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Repeated imaging

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

- |   | <b>yes</b>            | <b>sometimes</b>      | <b>no</b>             | <b>I don't know</b>   |
|---|-----------------------|-----------------------|-----------------------|-----------------------|
| 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"/> |

Which of the following findings are serious enough to influence the decision for surgery?

AR=Abdominal Radiograph; US=Ultrasound

- |  | <b>definitely</b>     | <b>sometimes</b>      | <b>no</b>             | <b>I don't know</b>   |
|--|-----------------------|-----------------------|-----------------------|-----------------------|
| Pneumoperitoneum on AR                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Pneumoperitoneum in US                     | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Portal venous gas on AR                    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| Portal venous gas in US                    | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |
| “Fixed/persistent loop” on sequential AR   | <input type="radio"/> | <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"/> | <input type="radio"/> |
| Other. Please specify below.               | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> | <input type="radio"/> |

Other:

## Abdominal Radiography

What pictures are included in the abdominal radiography 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 the neonatologists read the radiographs themselves?

- always
- sometimes
- no
- I don't know

What is evaluated in the AR in suspected NEC at your department?  
Please indicate the importance of each finding (great, some or none).

	great	some	none
Intestinal dilatation	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pattern of gas distribution	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Separation of intestinal loops	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
"Fixed/persisting loop" on sequential radiographs	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pneumatosis intestinalis/intramural gas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Portal venous gas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Pneumoperitoneum/free gas	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other signs. Please specify below.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other signs:

## Ultrasound

What do you think about abdominal ultrasound in NEC diagnostics?

	<b>yes</b>	<b>sometimes</b>	<b>no</b>	<b>no opinion</b>
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

	<b>yes</b>	<b>sometimes</b>	<b>no</b>
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, indicate "no" on the first question and leave the rest blank.

	<b>yes</b>	<b>no</b>	<b>I don't know</b>
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"/>
Mesenteric circulation (with doppler)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

yes no I don't know

Other signs. Please specify below.

Other signs:

Do neonatologists or pediatric surgeons at your hospital do ultrasound of head or abdomen themselves?

all some no

Head

Full abdominal

Screening for PVG

Comment:

Are saved pictures or cine loops made by neonatologists reevaluated by a radiologist??

- 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.