Reducing the Number of Inappropriate Babygrams Performed in the NICU

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Purpose and Rationale

There is a high frequency of using an inappropriately large field of view radiography (babygrams), sometimes without gonadal shielding, in the NICU, leading to unnecessary radiation exposure in vulnerable infants (see references).

Some babygrams are indicated for line position, or screening for surfactant deficiency and necrotizing enterocolitis in the setting of prematurity, and performed correctly (correct order, correct performance). Some are ordered incorrectly in lieu of a chest or abdominal radiograph (incorrect order, correct performance). Some are ordered as chest or abdominal radiographs, but incorrectly performed as babygrams due to technologist error or inexperience with very small neonates (correct order, incorrect performance).

References

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Project Measures

Metric 1

Numerator # of babygrams

Denominator total # of NICU radiographs (chest, abdomen, both)

Metric 2

Numerator # of unindicated babygrams

Denominator total # of babygrams

Metric 3

Numerator # of unindicated babygrams

Denominator total number of NICU radiographs

Metric 4 (Optional)

Numerator # of babygrams including the gonads and abdomen radiographs without shielding or collimation to exclude the gonads

Denominator total # of babygrams including gonads and abdomen radiographs

Baseline Data Collection Methodology

Use PACS or RIS to select an appropriate number of consecutive NICU radiographs for retrospective analysis. Include all chest and abdomen radiographs and babygrams (if you have that order in your RIS). Exclude radiographs of the extremities. The total number of the included radiographs is the denominator for metric 1 and metric 3.

A reasonable sample size: 100 consecutive NICU chest and abdominal radiographic studies for a small volume institution, or a sample size of 10% of the annual volume of such studies for a large volume site.

Definition of a babygram: too large a field of view for a chest or abdomen radiograph. For example, an abdomen radiograph that includes the entire heart or a chest radiograph that extends to the iliac crests.

Retrospectively evaluate the field of view for all radiographs. Separate the radiographs into babygrams and nonbabygrams. The total number of babygrams is the denominator for metric 2. For the babygrams, determine the presence of an appropriate indication for the babygrams from documentation on the order (for example, “babygram” or “line placement” or concerns about both the chest and abdomen). The remainder of the babygrams are designated “unindicated”.

(Optional) Record the presence of appropriate gonad shielding on babygrams and abdominal radiographs. The data should be separated into male and female and evaluated based on the different position of the gonads in boys and girls. Radiographs for which the gonads were not included due to collimation should not be included in the numerator. For girls, use of gonadal shielding could obscure pathology, so one may not want to include girls in the analysis.

Data Analysis

Possible contributors to using too wide a field of view may include the following:

1. The NICU physicians lack of awareness of radiation risk (incorrect order, correct performance).
2. Inadequate documentation of the indication for an indicated babygram (incorrect order, correct performance).
3. Uncertainty on the part of some of the NICU personnel regarding the indication for the exam and wishing to err on the side of a larger field of view so as not to obscure pathology. The request for a wider field of view may be communicated verbally to the technologist at the time the exam is obtained and therefore not included in the patient record (incorrect order, correct performance).
4. Lack of expertise in working with tiny infants or uncertainty on the part of the radiologic technologist regarding the indication for the exam and wishing to err on the side of a larger field of view so as not to obscure pathology (correct order, incorrect performance).

Potential Remedies/Interventions

Selection of potential remedy depends on your hypothesis regarding underlying cause or causes of use of apparently inappropriately wide field of view in your practice. In general, incorrect order can be attributed to the NICU staff and incorrect performance to the radiologic technologist. Examples of possible interventions include the following:

1. Review with the NICU the importance of the ALARA principle of dose reduction.
2. Inform the NICU staff of the importance of proper documentation of the indication for babygrams in the patient record and the fact that you are tracking unindicated babygrams. You can agree on a method of indicating when a babygram is truly indicated (for example, ordering both chest and abdomen, ordering a babygram (if that order exists on your RIS) only when truly indicated, or using a specific comment in the order such as “babygram” or “line placement” or comments related to both the chest and the abdomen).
3. Review with the NICU staff the importance of communicating the indication for radiographic exams among themselves, so that orders are not changed at the time of the performance of the exam.
4. Review the importance of ALARA principle of dose reduction and proper collimation and shielding techniques for premature infants with the radiologic technologists. Make sure that they understand that the exposed field of view is what counts, not just the image that appears on the PACS since they can post-process the image to limit what is viewed. Instruct the technologists to perform a babygram only if the proper method for ordering them is followed.
5. Establish and use a system for providing feedback to the radiologic technologists when they use an inappropriately large field of view or fail to use a gonad shield.

Post Intervention Data Collection
Choose the most likely intervention to bring about a change, implement it, wait some period to assure that intervention has been completed, and collect data again in the same way as for the baseline data collection.

Analyze the data in the same way, using the same definitions and the same metrics. You should also try to document compliance with your intervention if you are able to do so. Sometimes failure of your intervention is due to failure of compliance rather than failure of the method.

If you have met your goal, then establish a plan to maintain the gain by institutionalizing your successful intervention as a Standard Operating Procedure, and by reviewing radiation risk information and the new SOP with the appropriate personnel (NICU team and/or radiologic technologists) annually. Measure again in the same fashion to ensure that you are maintaining. Begin another PQI project.

If you have not met your goal, then analyze the data to determine what has changed and what has not and make inferences about why this happened. A change of 20% in one or more of the metrics is considered significant. Can you do more to bring about more improvement? If an unexpected result occurred, consider explanations for this result. How do these findings change your evaluation of the problem?

Determine which of the proposed remedies would be most effective based on your new evaluation and begin the cycle again.