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RSNA Radiological Society of North America

Reducing Quality Failure Rates of Portable Chest X-Ray Films Through a Multi-Step Educational Curriculum for Radiology Technologists

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Background

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- PCXRs used widely for patients with limited mobility and routine floor patients
- Easily detect pneumonia, pneumothorax (PTX), and acute thoracic trauma
- Poor image quality has been noted to affect radiologist's interpretation of PCXR films
- Proper patient positioning by radiology technologists of utmost importance

Rationale

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- Understanding of the various **factors** associated with patient rotation, obstructed anatomy and misinterpreting pathology in PCXRs is crucial for ensuring future patients are diagnosed timely and accurately

- There is currently a gap in the literature about whether assisting radiology technologists with capturing PCXR films can lower image quality failure rates

- In general, literature surrounding efficacy and usage of PCXRs is very limited

Purpose

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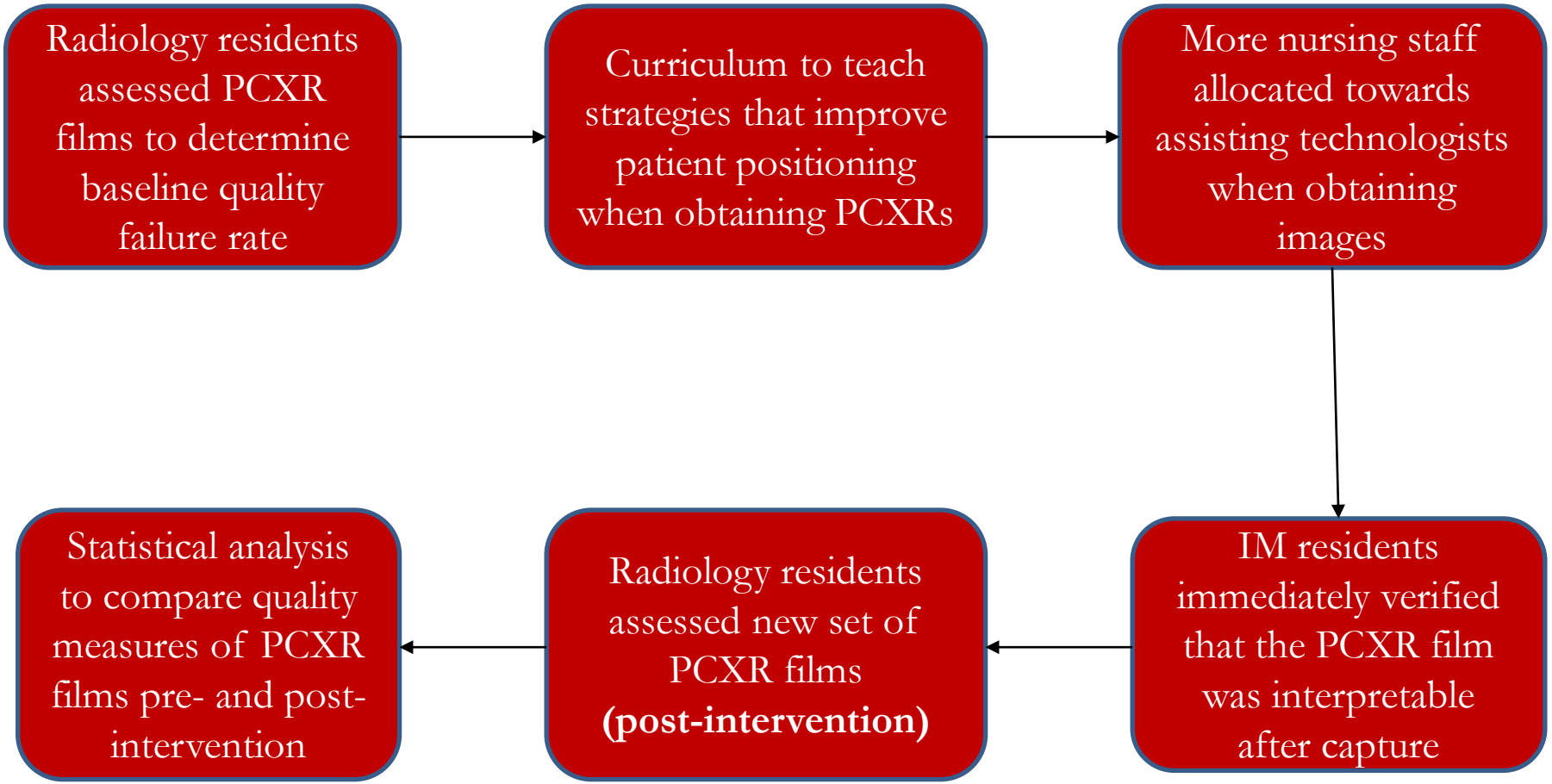
1. Identify a baseline in PCXR quality failure rates and subsequently generate interventions directed at radiology technologists.

2. Determine whether interventions that target these underlying causes can lower PCXR quality failure rates.


Radiology residents assessed PCXR films to determine baseline quality failure rate
Curriculum to teach strategies that improve patient positioning when obtaining PCXRs
More nursing staff allocated towards assisting technologists when obtaining images
IM residents immediately verified that the PCXR film was interpretable after capture
Radiology residents assessed new set of PCXR films (post-intervention)
Statistical analysis to compare quality measures of PCXR films pre- and post-intervention

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Survey Questions for Residents

Question	Range of Responses
1.Does the anatomy of the image suggest there is patient rotation?	0: Almost none 1: Mild rotation 2: Subjective rotation 3: Severe rotation
2.Does the anatomy of the image suggest there is vertical or up/down rotation?	0: No 1: Yes
3.Are there any foreign or external objects overlying the chest that either obscure significant amounts of anatomy or obscure critical areas?	0: No 1: Yes
4.Any portion of chest anatomy cut-off or obscured? Please specify.	0: No 1: Yes (specify: costophrenic angle, first ribs, lateral ribs, lateral lung, lung apices, lung bases)

Question	Range of Responses
5.Does this study appear subjectively underpenetrated?	0: No 1: Yes
6.Did the technical problem impact ability to detect finding when compared with a prior study or future study?	0: No 1: Yes
7.During what shift was this image acquired?	1: Morning Shift (8:00 AM to 3:59 PM) 2: Evening Shift (4:00 PM to 11:59 PM) 3: Night Shift (12:00 AM to 7:59 AM)

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	Pre-Intervention	Post-Intervention
Number of total PCXRs (Number of problematic PCXRs Assessed)	500 (231)	287 (188)
Mean Patient Rotation Score (Range of 0 to 3)	1.3 ± 1.0	0.67 ± 0.49
No Rotation (0/3):	60 (25.9%)	100 (53.2%)
Mild Rotation (1/3):	69 (29.9%)	56 (29.8%)
Subjective Rotation (2/3):	71 (30.7%)	26 (13.8%)
Severe Rotation (3/3):	31 (13.4%)	6 (3.2%)
P-Value for Difference in Mean Patient Rotation Score Pre and Post Intervention	$P < 0.005$	
Number of PCXRs with Up/Down Rotation	100 (43.2%)	76 (40.4%)
Number of PCXRs with External or Foreign Objects Obscuring Anatomy	116 (50.2%)	55 (29.3%)
Number of PCXRs with Partial or Complete Anatomy Absent	115 (49.8%)	73 (38.8%)
Number of Studies Available for Comparison (within one week of PCXR)	168	172
Technical Problem Impacted Ability to Detect Pathology When Compared with Previous Study	73 (31.6%)	21 (12.2%)
Percentage of Problematic Films per Shift		
Morning Shift:	28%	32.6%
Evening Shift:	24%	13.6%
Night Shift:	48%	53.8%

Anticipated Results

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- Reduced patient rotation
- Numerous strengths and weaknesses
- Difficult to compare results due to lack of previous studies
- Night shift image capture remains a major concern

Conclusion

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- Intervention successful for:
- Lowering mean patient rotation scores
- Improving ability to detect pathology
- Less films with obstructed anatomy due to foreign objects Implement measures to reduce quality failures associated with PCXRs captured during night shifts.

- Hospitals can implement various measures to benefit PCXR films from night shifts:
- Allocate more experienced workers to night shifts to assist technologists with patient positioning
- Future studies to assess the benefits of similar interventions to reduce image quality failure rates.

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