Optimizing HRCT Protocols In A Large Community Hospital With Prone Expiratory Imaging

Quality Improvement Projects: R5A-QI-6

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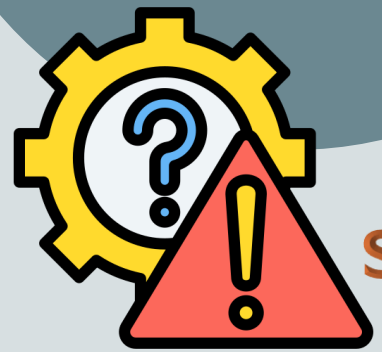
Introduction: The problem

HRCT for ILD diagnosis



- **High-resolution computed tomography (HRCT):** Important in diagnosing interstitial lung disease (ILD)

HOWEVER--

- In the past: No standard HRCT protocol at Grady Hospital
  - Various HRCT protocols used
  - Lack of true inspiratory and expiratory imaging
  - Motion artifact
  - No prone images

Suboptimal and inconsistent diagnostic quality for ILD

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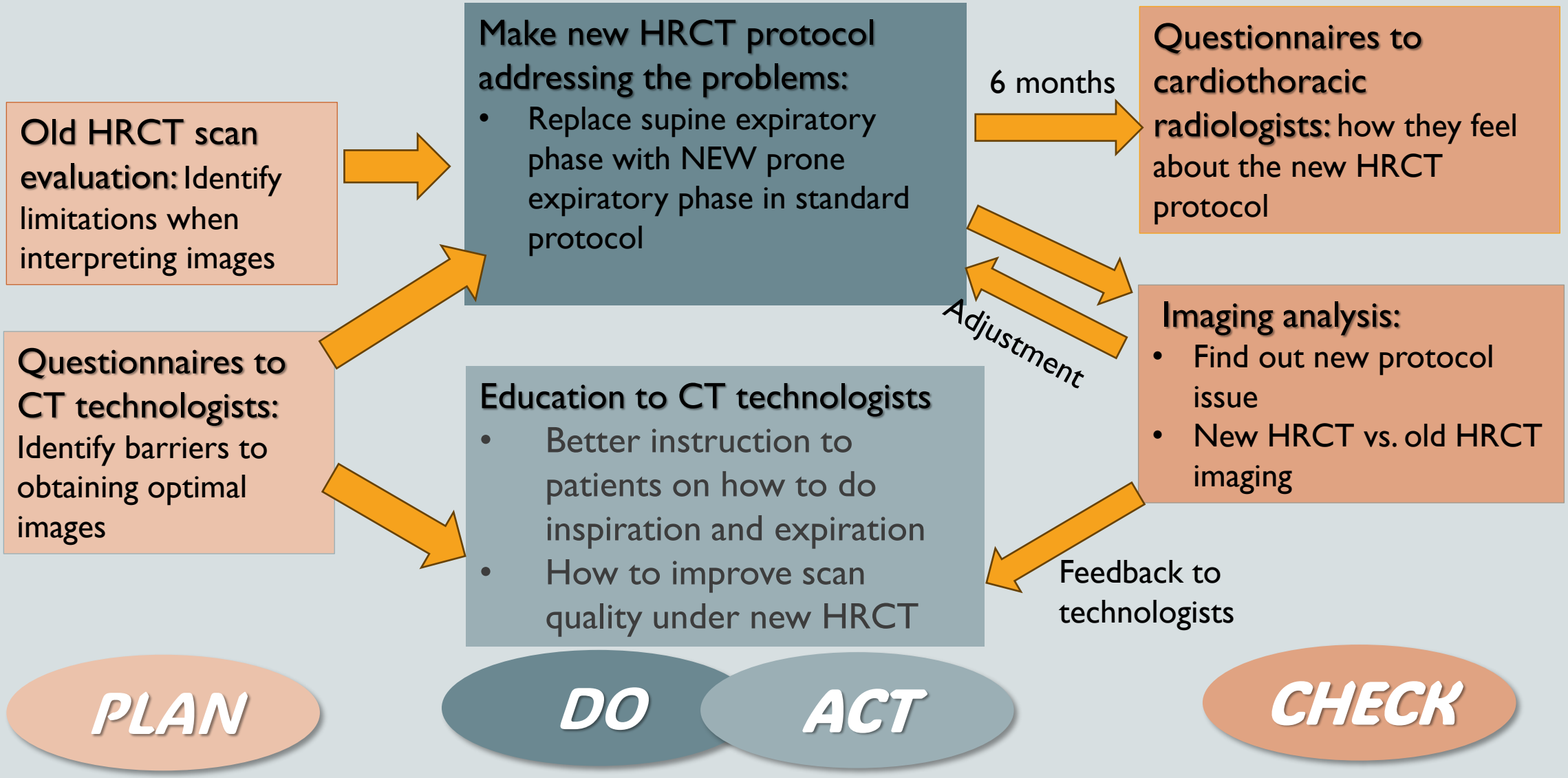
Method: What have we done to improve



Method: What have we done to improve

New HRCT protocol with prone expiratory and supine inspiratory ONLY

NEW

Expiratory

prone

+

Breath-hold

supine

Imaging analysis

- Expiratory effort?
- Motion artifact?
- Diagnostic confidence for ILD?

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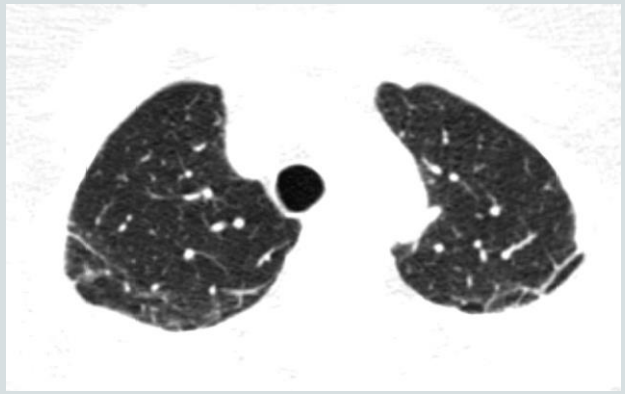
Results: Is it working?

New HRCT protocol with prone expiratory for ILD

When compared to the old various HRCT protocols:

- ✓ **Good consistency and reproducibility**: Only 3 scans (3/109, 2.8%) were not performed in accordance with the new protocol (8/2023 –1/2024).
- ✓ **Improved expiratory effort** among patients on proning (49.4% vs 78.3%, p <0.01)

New prone expiration



Old supine expiration

Patient 1

New prone expiration

Old supine expiration

Patient 2

Bowing of posterior membrane of trachea (arrow): indicative of better expiratory effort with prone

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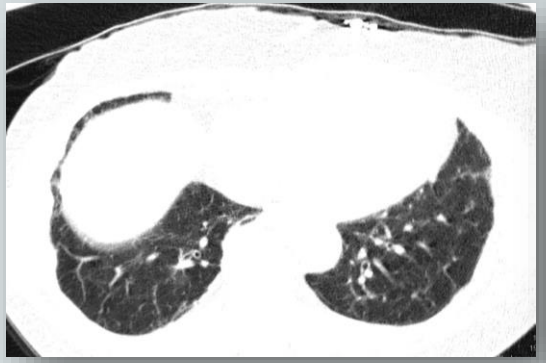
Results: Is it working?

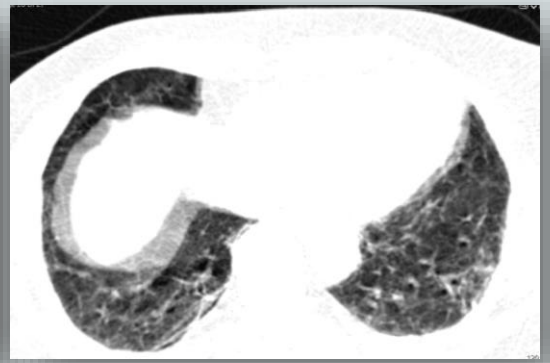
New HRCT protocol with prone expiratory for ILD

When compared to the old HRCT protocols:

✓ **Reduce motion artifact** (20.2% vs 62.9%, p <0.01).



New prone expiration

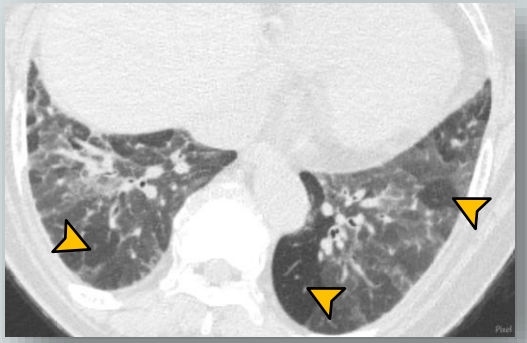


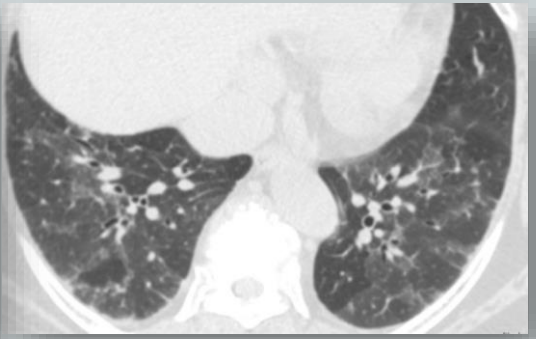
Old supine expiration

✓ **Better visualization of air-trapping**

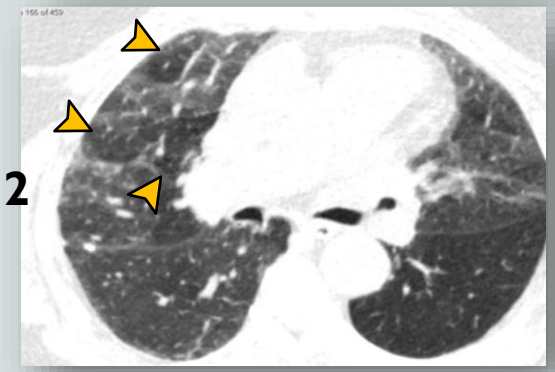
New prone expiration | Old supine expiration

Patient 1





Patient 2



Air-trapping is better seen (Left, arrows) on prone

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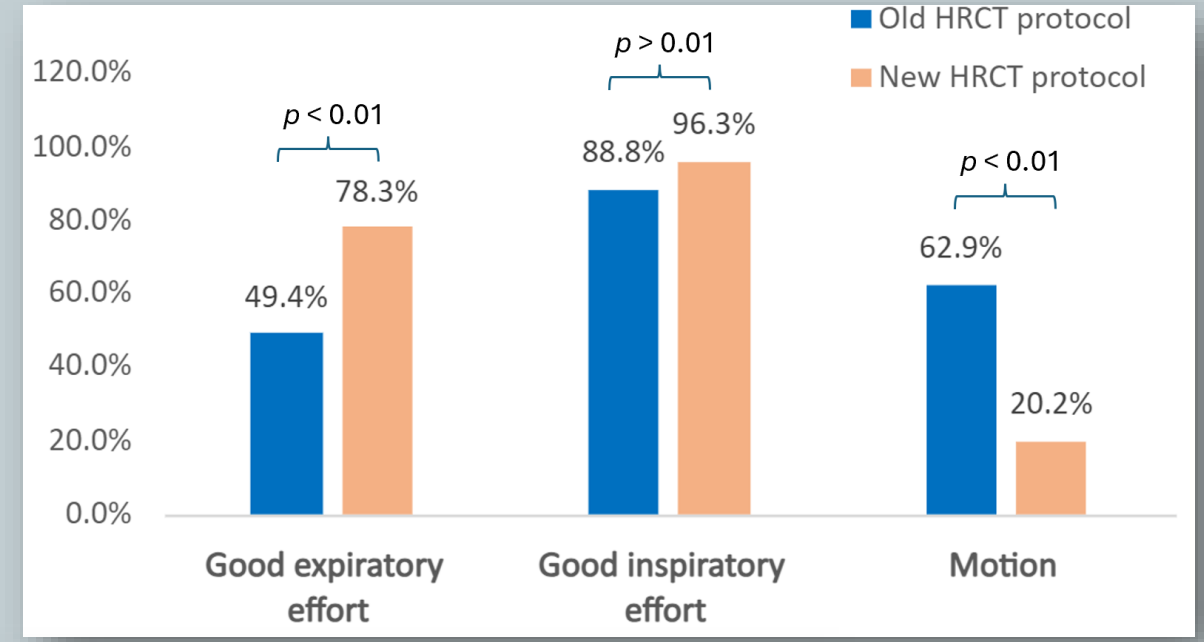
Results summary: It is working!

New HRCT protocol with prone expiratory

Imaging analysis showed prone expiration improves expiration effort, and reduce motion artifact

When compared to the old various HRCT protocols:



	Prone Expiratory	Good expiratory effort	Good inspiratory effort	Motion
Old HRCT protocol	0% (0/89)	49.4% (44/89)	88.8% (79/89)	62.9% (56/89)
New HRCT protocol	97.2% (106/109)	68.9% (73/106)	96.3% (105/109)	20.2% (22/109)
***p*-value**	NA	0.0090	0.0739	2.29E-09

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Results: Questionnaires

New HRCT protocol with prone expiratory

When compared to the old various HRCT protocols:

Radiologist questionnaires result

All radiologists highly rated this new HRCT protocol with increased confidence in ILD diagnosis.

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Summary

New HRCT protocol with prone expiratory for ILD

Technically easy and reproducible

Reduces motion and improves expiratory effort for patients, which optimizes evaluation for air trapping

Optimizes workflow efficiency by no longer needing to protocol since proning is standard and maintains only two acquisitions reducing scanner time

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