

Scanning for QI: Outcomes from a Resident and Sonographer Driven Improvement of Radiology Resident Ultrasound Technique

Brian Blumhof, MD, Corinne Wessner, BS, RDMS, RVT, Kristen McClure, MD

Department of Radiology, Thomas Jefferson University Hospital, Philadelphia, PA

Background

Unique among radiology's imaging modalities, ultrasound is highly dependent upon the user, typically a dedicated ultrasound technologist, producing diagnostic images.

Residents at radiology training programs quickly develop the ability to interpret images, but acquiring the acumen to aid sonographers during difficult studies or to independently scan patients remains a concern among trainees², including at Jefferson.

The Division of Ultrasound at Jefferson has a long history of "Teaching the Teachers," or endowing visiting radiologists with the confidence to scan via educational programs¹.

However, a similar dedicated program for residents at Jefferson does not exist, and a resident's inability to find time to scan patients during increasingly busy days of interpreting studies is a frequent comment during resident feedback sessions.

Objective

The aim of this structural quality improvement (QI) project was to improve the educational ultrasound curriculum.

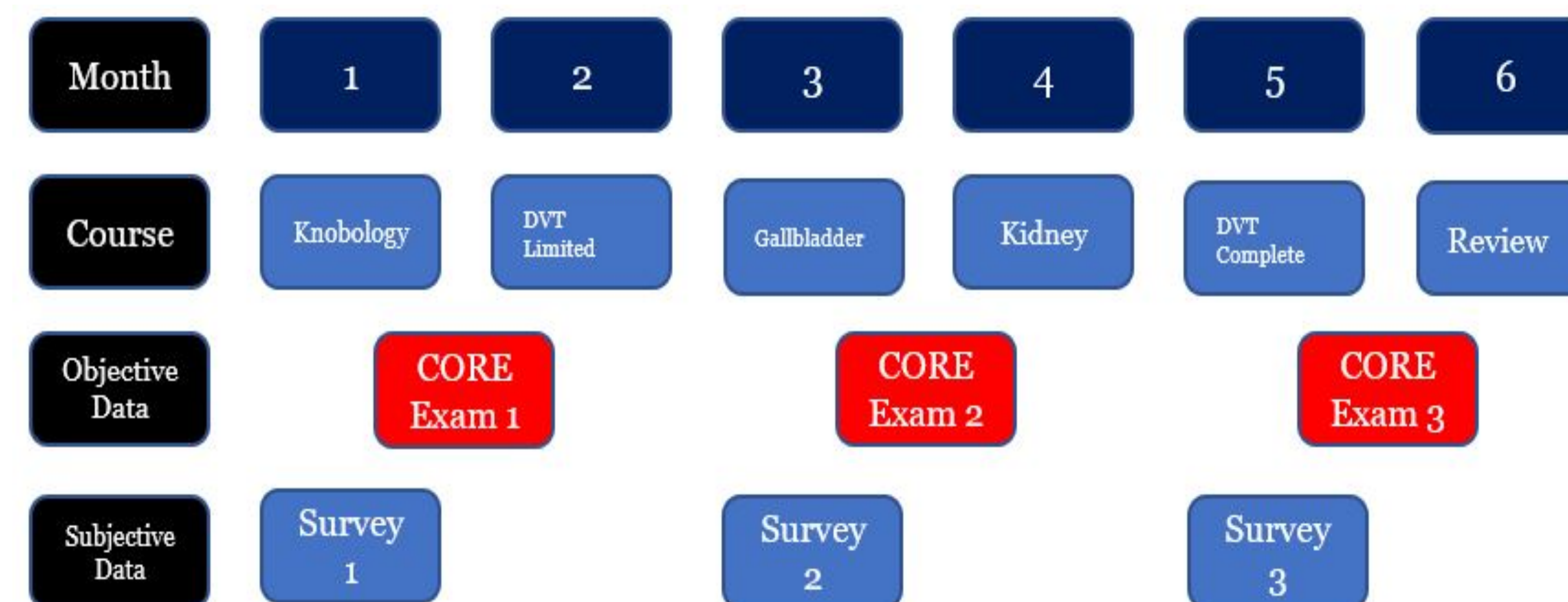
We created the pilot for an enduring addition to the radiology residency at Jefferson, with plans to include additional ultrasound examinations as the curriculum becomes more robust.

Stakeholders included not only the radiology residency, which would benefit from improved resident education and knowledge, but also the hospital and ultimately patients, who stand to benefit from improved delivery of care.



Intervention and Data

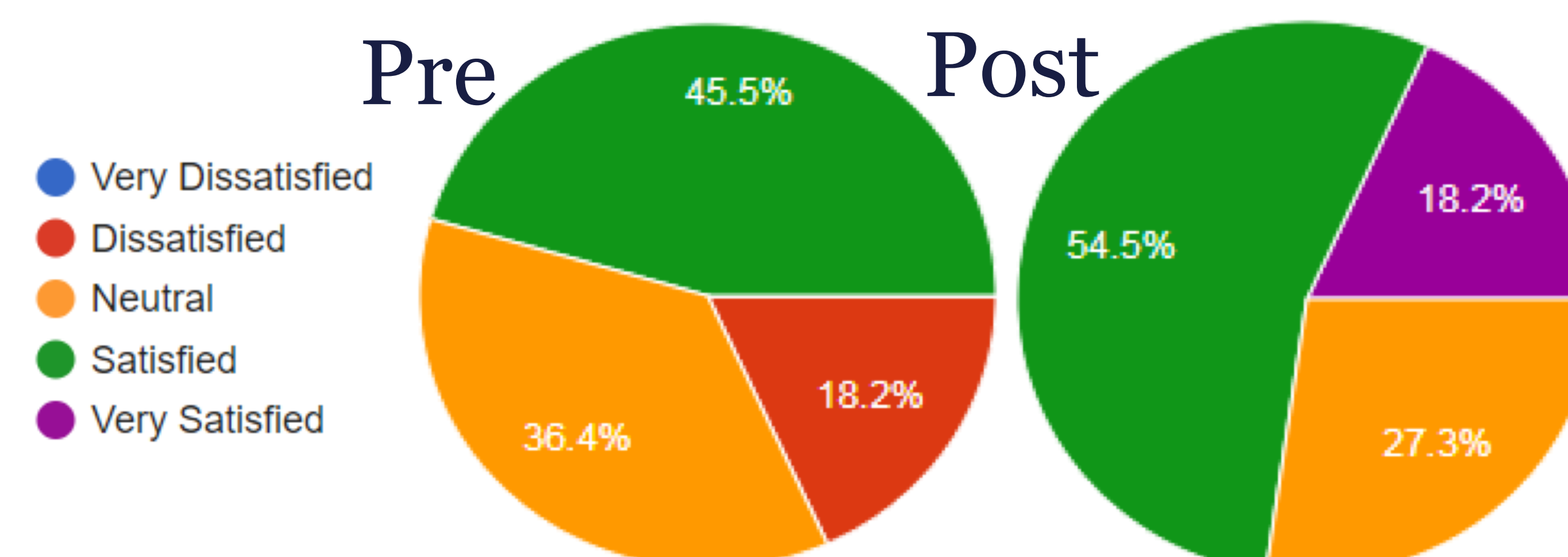
- Scanning Sessions:** Residents practiced supervised hands-on scanning on a near-monthly basis at Jefferson's Clinical Skills and Simulation Center after work hours. Prior to attending, residents received a short electronic presentation on pertinent technique, anatomy, and pathology.



- Statistical Analysis:** Pre and post intervention data for multiple outcomes were compared using the Wilcoxon signed ranks test along a Likert scale, with higher values (reported as cohort mean) indicating higher confidence or better performance, and an alpha value of 0.05.
- Subjective Survey:** Prior to, at mid-point of, and at completion of the course, the population of first-year radiology residents in the 2019-2020 academic year (total N = 11) completed a survey.

Subjective Survey Data						
N=11 (P values)	Ability to adequately perform and document a sonographic examination	Ability to adequately interpret sonographic examinations	Ability to document portal vein thrombosis	Ability to document hydronephrosis	Ability to document cholecystitis	Ability to document deep vein thrombosis
Pre vs Post	1.4 vs 3.4 (0.003)	1.3 vs 2.7 (0.007)	1.6 vs 3.2 (0.006)	1.7 vs 3.9 (0.004)	1.6 vs 4.0 (0.004)	1.4 vs 3.3 (0.005)

- Balancing Measure:** "Rate your level of satisfaction with time spent learning radiology outside clinical hours." There was no significant negative change in the balancing measure, as residents (N = 11) reported feeling more satisfied with time spent learning radiology outside of work hours at the end of the curriculum than at the beginning (3.9 vs 3.2, respectively; p = 0.011).



- Objective CORE Exam:** Gallbladder and right kidney examinations performed on standardized patients and observed by a research sonographer.

Gallbladder Scanning Skills Examinations		Kidney Scanning Skills Examinations	
N = 10 (P values)	Pre vs Post	N = 10 (P values)	Pre vs Post
Gallbladder Long Depth	1.3 vs 3.5 (0.009)	Kidney Long Depth	2.3 vs 3.9 (0.007)
Gallbladder Long Gain	1.4 vs 3.5 (0.007)	Kidney Long Gain	2.0 vs 3.6 (0.004)
Gallbladder Long Annotation	1.1 vs 2.9 (0.040)	Kidney Long Annotation	1.3 vs 3.3 (0.026)
Gallbladder Transverse Depth	1.2 vs 3.6 (0.010)	Kidney Transverse Depth	2.4 vs 3.7 (0.006)
Gallbladder Transverse Gain	1.1 vs 3.8 (0.004)	Kidney Transverse Gain	1.9 vs 3.5 (0.008)
Gallbladder Transverse Annotation	1.0 vs 3.2 (0.023)	Kidney Transverse Annotation	1.7 vs 3.3 (0.033)

Discussion and Future Directions

- Aim:** Improve the primary outcomes of overall subjective resident confidence and objective technical ability by 20% within the 6 month period, between July 2019 and December 2019.
 - Achieved across all metrics above.
- Secondary Outcomes:** Subjective resident confidence in specific examinations, as well as various aforementioned technical factors.
 - Improved across all metrics above.

Based on our results, the program will become a permanent facet of the radiology residency with plans to include inter-departmental educational opportunities, such as working with internal medicine residents to assess the IVC or place catheters using ultrasound guidance, working with emergency medicine residents to practice eFAST technique, or working with vascular surgery residents to interrogate vessels with Doppler and evaluate cardiac function.

References

- Goldberg, BB et al. "Effectiveness of the 'teaching the teachers' diagnostic US training program." Academic Radiology (2001) Nov;8(11):1159-67.
- Tahir, B et al. "Taking Resident Feedback Seriously: A Hands-On Ultrasound Course." Academic Radiology (2016) Dec;23(12):1610-1613.