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

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Background

Radiology offers a plethora of imaging modalities, but unique among these, 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 trainees (reference 2), 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 programs (reference 1).

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 QI project is to improve the educational ultrasound curriculum, thus improving overall resident confidence and technical ability in acquiring diagnostic quality sonographic images.
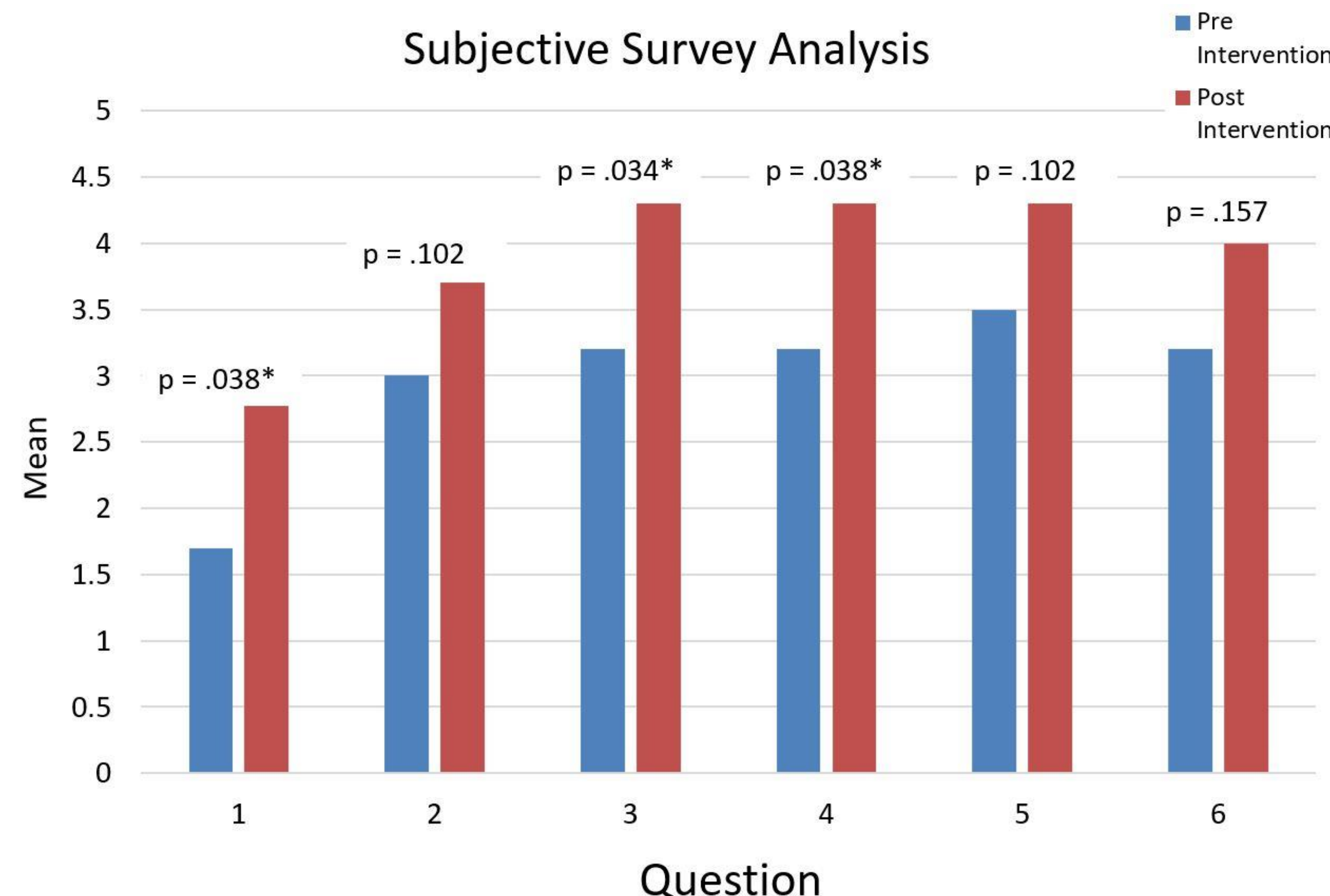
Comparing resident confidence levels and performance against their initial benchmarks as well as against yearly cohorts, we plan to create a long-standing addition to the radiology residency at Jefferson, with plans to include additional ultrasound examinations as the curriculum becomes more robust.

Stakeholders include 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. Additionally, other residency programs at the hospital can be considered stakeholders, as success of this program raises the possibility of inter-departmental educational opportunities.

Pilot Intervention

- **Scanning Sessions:** Following demonstrations by the ultrasound technologist, residents practiced supervised hands-on scanning on a near-monthly basis at the Jefferson simulation center after work hours. Prior to attending, residents received a short electronic presentation on pertinent technique, anatomy, and pathology.
- **Subjective Survey:** Prior to the course, the population of radiology residents in the 2018-2019 academic year voluntarily completed a survey, which was again completed near the end of the academic year (total completing both surveys, N=6).
- **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 indicating higher confidence.
  - While resident confidence improved in portal vein (3) and renal (4) studies, typically more technically demanding, there was no change for gallbladder fossa (5) or DVT (6) studies, perhaps due to the commonplace nature and relative ease of these studies.
  - Overall resident confidence in performing and documenting studies (1) improved without change in resident confidence in accurately interpreting studies (2), likely accounted for by the daily practice of radiology, where most ultrasound images read by radiologists are produced by ultrasound technologists.

Subjective Survey Analysis

Mean vs Question. Legend: Pre Intervention, Post Intervention.

p-values by question: Question 1: p = .038*; Question 2: p = .102; Question 3: p = .034*; Question 4: p = .038*; Question 5: p = .102; Question 6: p = .157

- **Objective CORE Exam:** During the first half of the course, the population participated in an objective scanning session observed by the ultrasound technologist utilizing volunteer "patients" outside the intervention population to evaluate specific metrics related to performance of a diagnostic ultrasound scan, including transducer selection, anatomic acquisition, correctness of measurements, and image optimization. Due to constraints of this pilot, objective data at the end of the academic year was not obtained.
- **Balancing Measure:** Assess, via the above subjective survey, resident satisfaction with time spent learning radiology outside of clinical hours. Note is made that this was included during re-development of the survey, and comparative data is not available.
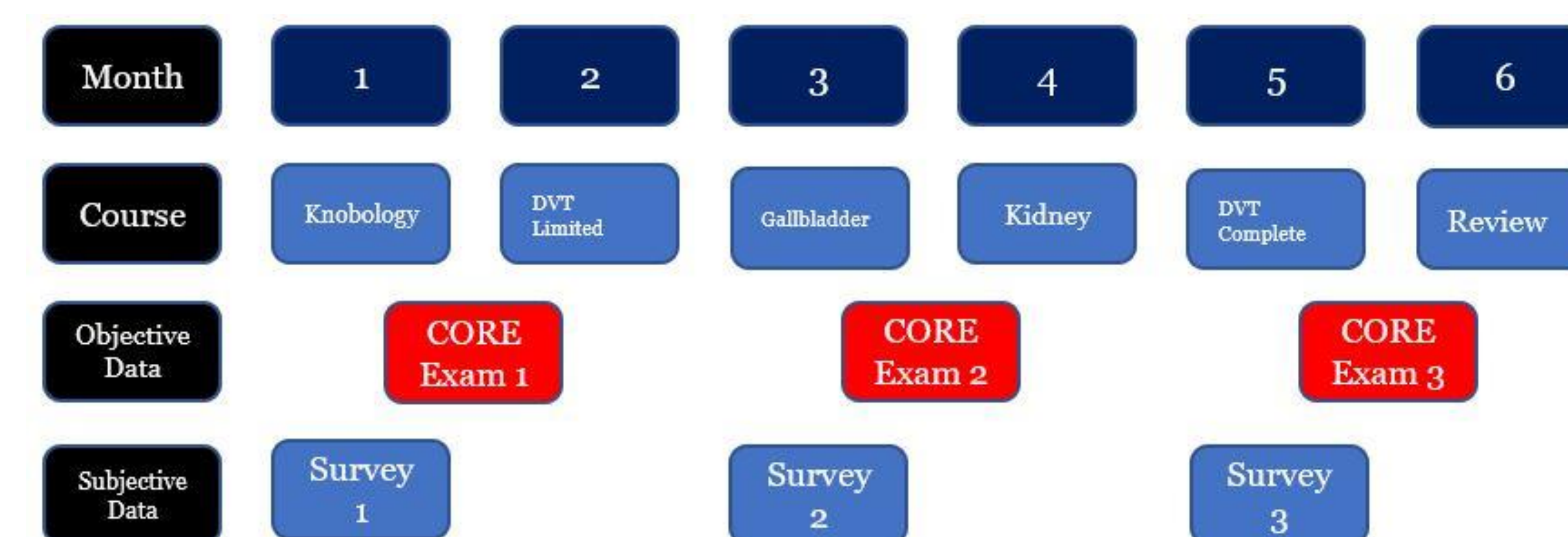
Planned 6-Month Curriculum

Following resident feedback and internal planning, we have narrowed our scope and produced a longitudinal 6-month curriculum to build on the pilot program, beginning at the start of academic year 2019-2020:

- **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.
- **Population:** Incoming first year radiology residents (11), with voluntary enrollment of rising second year residents (up to 10).
- **Secondary Outcomes:** Subjective resident confidence in specific examinations, as below, as well as various aforementioned technical factors.

Additions to the curriculum will include incorporation of standardized patients for both scanning sessions and objective CORE examinations to reduce barriers to participation and improve data robustness.

Given national conference and board examination scheduling in radiology, the second 6 months of the academic year will be dedicated to various additional scanning sessions.

Month	1	2	3	4	5	6
Course	Knobology	DVT Limited	Gallbladder	Kidney	DVT Complete	Review
Objective Data		CORE Exam 1		CORE Exam 2		CORE Exam 3
Subjective Data	Survey 1		Survey 2		Survey 3	

Future Directions

Based on results of the planned 6-month curriculum, we hope to expand the program 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.

References

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