

CORRESPONDENCE

Learning Curves, Credentialing, and the Need for Ultrasound Fellowships

To the Editor:—We read with great personal interest the letter from Blaivas and colleagues in the August 2002 issue of *Academic Emergency Medicine*.¹ One of us (DJH) is an emergency medicine specialist who has now performed more than 600 ultrasound examinations in an emergency department (ED) setting during a period of controversy and rapidly evolving policy with regard to the training and credentialing requirements that should be in place to allow ED physicians to perform this service. As Blaivas et al. point out, now we are seeing the emergence of ultrasound fellowship programs with questions being raised again about what should be considered adequate training, numbers of proctored ultrasound examinations, and proficiency levels.

The Sonography Outcomes Assessment Program (SOAP) has been instituted to provide evidence-based data that should prove useful to policy and credentialing decisions. Prior to this initiative, many small studies have looked at the efficacy of different training programs lasting from days^{2,3} to hours,^{4,5} or even self-taught CD-based programs,⁶ almost all of which show the effectiveness of minimal training in ED ultrasound evaluation, even in the hands of a relative novice. The number of examinations thought necessary for adequate training seems to have varied over time from as few as 25 per application (150 total examinations)⁷ up to 600 recommended by Blaivas et al.¹ for the fellowship programs. Nobody has defined an acceptable accuracy level required in order for an ED physician to be deemed competent to perform the procedure.

The underlying assumption to all of these discussions and debates is that useful image quality and diagnostic accuracy will be low at first, and will improve over time with further

training and experience, i.e., students will exhibit a natural learning curve. We have seen no study to date that determines learning curves, and no studies have proposed that these learning curves be examined.

I (DJH) was curious to examine my own learning curve to see what it might show for the standard ED ultrasound questions (FAST = presence of peritoneal fluid, cardiac = presence of pericardial effusion, gallbladder = presence of stones, renal = presence of hydronephrosis, aorta = presence of abdominal aortic aneurysm, pelvic = presence of intrauterine pregnancy, vascular = presence of deep vein thrombosis, testicular = presence of torsion, etc.). My initial training involved 40 hours of didactic lectures and hands-on training divided between three separate one- or two-day courses in Chicago, Atlanta, and Houston. These were designed for emergency physicians and are typical of the training an ED physician might obtain for ultrasound outside of residency. I performed all the studies on a convenience sample in the ED. My diagnoses were recorded and all patients had follow-up diagnosis confirmed usually by computed tomography or ultrasound in radiology. Results are shown in Table 1 and Figure 1.

For most applications, the first 25 examinations showed no learning curve at all (100% accuracy). With time, missed diagnoses occurred in some, but not all, applications. The worst case is presented in Figure 1. In a total of 600 subsequent examinations, the percentage of correct diagnoses dropped only to 97.0%. With the exception of gallbladder and vascular examinations, the accuracy rate for any specific application never dropped below 95% at any point in time. The rate never fell below 90% and 80% for gallbladder and

TABLE 1. Percentages of Correct Ultrasound Diagnoses over Initial and Subsequent Examinations in Specific Applications

Category	% Correct in First 25 Exams (No. Correct/No. Total)	% Correct in Subsequent Exams (No. Correct/No. Total)	% Correct over All Exams (No. Correct/No. Total)
Aorta evaluation for presence of abdominal aortic aneurysm	100% (25/25)	96.1% (49/51)	97.4% (74/76)
Cardiac evaluation for presence of pericardial effusion	100% (25/25)	100% (42/42)	100% (67/67)
FAST* evaluation for presence of peritoneal fluid	100% (25/25)	99.3% (134/135)	99.4% (159/160)
Gallbladder evaluation for presence of gallstones	96.0% (24/25)	95.6% (129/135)	95.6% (153/160)
Pelvic/obstetric evaluation for presence of intrauterine pregnancy	100% (25/25)	93.8% (30/32)	96.5% (55/57)
Renal evaluation for presence of hydronephrosis	100% (25/25)	90% (18/20)	95.6% (43/45)
Testicular evaluation for torsion	100% (6/6)	—	100% (6/6)
Vascular evaluation for presence of deep vein thrombosis	92.0% (23/25)	89.5% (17/19)	90.9% (40/44)
Other procedural	100% (10/10)	—	100% (10/10)
Overall	100% (25/25)	97.0% (582/600)	97.1% (607/625)

*FAST = focused abdominal sonography for trauma.

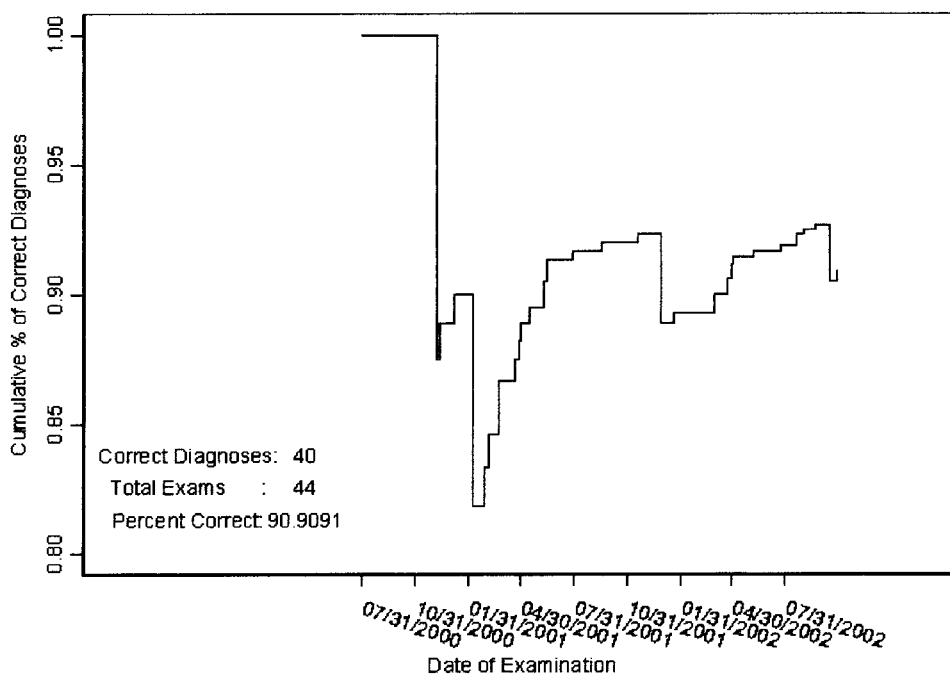


Figure 1. Cumulative percentage of correct diagnoses for vascular applications: worst case.

vascular examinations, respectively. These are useful and welcome rates in any emergency setting.

These results, while strictly anecdotal, raise the question of the need to establish arbitrary numbers of examinations prior to being credentialed for use of ultrasound in ED workups, especially for the traditional applications: FAST; cardiac to rule out pericardial effusion; transabdominal to rule out abdominal aortic aneurysms, cholelithiasis, or free peritoneal fluid; renal to rule out hydronephrosis; and pelvic to rule in intrauterine pregnancy.

Further studies are required to see whether mine is a common experience. If such studies reveal that a more traditional learning curve is the norm, then the cutoff for competency in each application should be set, and can further be used as a criterion for establishing continuing medical education requirements. If my experience is not unique, however, then there seems no need to meet minimum numbers of proctored examinations beyond didactic training, especially for the six traditional applications. More attention and emphasis should be placed on setting minimum performance standards for portable ED ultrasound equipment,⁸ or determining which new and extended applications are appropriate for ED examination.^{9,10}

While we agree that Susan Stern captured the essence of what a fellowship program should be,¹¹ and that the suggestions forwarded by Blaivas et al.¹ would accomplish that goal, we feel that we should not lose sight of the fact that ultrasound is an incredibly useful tool for ED assessment in certain applications. If trends continue toward requiring further training, resulting in demands for deference to more highly trained and experienced ED ultrasound fellows, then we may unnecessarily be falling into the same controversy among ourselves that was initially raised by the radiology ultrasound experts. Rather, efforts may better be spent in improving standards for available equipment, and identifying and extending new application areas.—**David J. Heegeman, MD** (heegeman.david@marshfieldclinic.org),

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