

POCUS – No longer Hocus Pocus

Ola Afolabi

Consultant, Emergency Department

Darlington Memorial Hospital

Ola.Afolabi@cddft.nhs.uk

Hocus pocus - the more you look, the less you see. The popular vanishing act noted among magicians does not apply to Point of Care Ultrasonography (POCUS). It is here to stay. This article aims to give a short overview of its history, recent developments and local applications.

Point of care ultrasound is the use of portable Ultrasound machine at a patient's bedside to answer a clinical question or to assist in medical procedures with the sole aim of improving patient outcome. Kendal et al¹ recognised six key characteristics of POCUS. It is an examination that is quickly performed, easily learned, with easily recognisable findings, which is focused and goal-directed at the bedside.

The rapid advancement of POCUS has now infiltrated many specialties in modern medical practice - like a trained virus - but I hasten to add a nice one that immunizes one against the doctor's most dreaded fear - of having a patient in front of you seriously ill and you have no clue about what's going on! Unlike the advent of stethoscopes², it is pleasing to see that this was not ridiculed and jettisoned by the medical fraternity, but subjected to the microscope of evidence-based medicine. Over 21 medical specialties have now embraced POCUS. Prominent amongst them are virtually all hospital-based specialities, but also importantly disaster medicine and pre-hospital medicine.³

The main driver for embracing this new set of knowledge and skills lately is from the recommendations of the various colleges and national guideline bodies. For example NICE guidelines expect the use of POCUS for the insertion of central Lines⁴ and the ATLS manual now expects providers to be able to do Focused Assessment with Sonography for Trauma (FAST) scans in traumatised patient⁵. In emergency medicine, the College of

Emergency Medicine (CEM) has now recognised Emergency Medicine Ultrasonography (EMUS) as a subspecialty interest and a chapter of the organisation now oversees the training and accrediting of EMUS among Emergency Medicine Doctors.

One of the first reports of medical ultrasound (US) was by Professor Ian Donald's team in Glasgow reported in the *Lancet* of 1958⁶. In the 1980s, German medical students were taught US as part of their curriculum and by 1987 Emergency Departments in the United States were using POCUS in trauma. By 1996 50% of EM residents in the USA were trained in POCUS. One of the earliest UK courses in FAST scanning was at King's College in London in 2001⁷ and the CEM regularly runs courses in POCUS in association with a group called INFOMED in the UK⁸.

Current uses of POCUS

I gave a talk at the PGME centre at Darlington in 2003, entitled *New Frontiers in EM and POCUS*. I enumerated six uses of POCUS in answering key pertinent binary questions in the emergency setting:

1. Is there blood in the peritoneum?
2. Is there an abdominal aortic aneurysm?
3. Is there evidence of obstructive uropathy?
4. Is there evidence of a living intrauterine pregnancy?
5. Is there evidence of cholelithiasis?
6. Is there evidence of a pericardial effusion?

A rapid answer to these six questions is extremely useful when faced with a critically ill or traumatised patient deteriorating in front of you when you need to make a lifesaving decision. Since this talk however, rapid advances in evidence-based knowledge have brought in new

algorithms with notable acronyms to help frontline doctors in diagnosing and assessing critically ill patients when history and examination findings are scarce or unreliable and the patient is too ill to be moved to the CT scanner.

As examples:

1. The 'ACES'⁹ (Abdominal and Cardiac Evaluation with sonography in Shock) protocol was coined by Atkinson et al in 2009 as a structured Sonographic approach to identify the cause of hypotension in a critically ill patient just using the level 1 training competency.
2. There is the RUSH (Rapid USS in Shock) exam advocated by Pereira et al in 2010. This examines the Pump for evidence of heart failure, the Pipes for evidence of Aortic aneurysm and DVT, and the Tanks - for evidence of free fluids in the abdomen, the size of the IVC as a surrogate guide to the central venous pressure (CVP), the chest for pleural effusion, pneumothoraces and PE¹⁰.
3. The FAST and RELIABLE proposed by Liteplo et al in 2012, uses level 2 competencies to identify the cause of hypotension and shock in critically ill patients¹¹. This is a more comprehensive search for pathologies with: FAST scan, Right ventricular strain, pericardial Effusion, Left ventricular function, IVC, Aorta, Blood clot (DVT), Lungs (pneumothoraces) and evidence of Ectopic pregnancy.

The pros and cons of these studies and pitfalls have been summarised in a paper by Liteplo, Noble and Atkinson et al in 2012.

Locally, the North East Emergency USS group (NEMUS) have drawn up the PACES (Pleura, Abdominal and Cardiac Evaluation Sonography) for their trainees.

Training

Adequate training from experienced Sonographers cannot be over emphasised. An unbridled enthusiasm without basic knowledge of ultrasound physics, Sonographic anatomy, instrumentation, practical skills in acquisition and interpretation can be likened to letting loose on a motorway a teenage driver taught by a school friend!

It takes weeks and several sessions of proper mentoring and hands-on training to become competent in POCUS and although the Royal College of Radiologists¹² recommendation for Radiology trainees is perhaps too much for a limited POCUS practitioner, some of the papers advocating fewer numbers of supervised examinations appear overambitious¹³. In view of this, the American College of Emergency Physicians (ACEP)¹⁴ and in the past few years the CEM have produced guidance on training, including a curriculum for EMUS, assessment and certification processes¹⁵.

The level one certification recommended by the CEM involves FAST scanning, AAA, Vascular access and Echo in life support. The Level 2 certification however entails more in-depth knowledge in areas such as DVT, hepato-biliary, renal, and musculoskeletal ultrasound.

Local experience

At Darlington Memorial Hospital ED, we obtained in 2009 a machine that was felt to be durable, portable and can withstand the rigours of a busy ED. After that, one of the consultants was sent for formal training over two years in a certificated course at Teesside University and supervised and mentored locally by the ultrasound department at DMH. The aim is to lead the department in EMUS (Emergency Medicine Ultrasonography). Over the years most of our senior doctors have been trained in the two day short courses, and are gradually being supervised in focused

sonography such as FAST, AAA and vascular access and Echo in life support. Once they have acquired enough experience, with a detailed log book, they will be encouraged to do the CEM assessment and be formally certified in level One POCUS in EMUS.

Cautionary notes

Despite the numerous benefits and versatility of POCUS, the potential to do harm still exists especially with inadequate training.

As an adjunct, POCUS is always used to help rule in a diagnosis and never to rule one out. So far the only medical malpractice case relating to POCUS is in the US where it is more widely used. But the complaint is for lack of use of POCUS (in diagnosing an ectopic pregnancy before it ruptured, a case won by the defense) - rather than for harm in using it ¹⁶.

The last word on POCUS is that it is here to stay, so get trained.

References:

1. Kendall JL, Hoffenberg SR, Smith RS. History of Emergency and critical care ultrasound: the evolution of a new imaging paradigm. Crit Care Med.20072007; 35(5 SUPPL.):S126-S130.
2. Jarman R D :Hocus PoCUS: Introducing point of care ultrasound.Ultrasound2011;19:2
3. Dana S: The history of point of care ultrasound use in Disaster and Mass casualty incidents: American medical Association virtual mentor. September 2010Vol12, No9: 744-749.
4. National Institute of clinical excellence: Guidance on the use of ultrasound locating devices for placing central venous catheter: Guidance no 49: sept 2002:1. <http://www.nice.org.uk/nicemedia/live/11474/32461/32461.pdf>.
5. American College of Surgeons (ACS).Advanced Trauma Life Support for Physicians.Chicago2012.
6. I Donald, MacVicar J, Brown TG. Investigation of abdominal masses by pulsed ultrasound. Lancet 1958; i:1188-95.
7. Thompson P, Brown R, Glucksman E. Bedside emergency department ultrasound. Emerg Med J 2001; 18:76
8. The Ultrasound level 1 Finishing School: <http://www.infomedltd.co.uk/usfinishingschool>
9. Atkinson PR, McCauley DJ, Kendall RJ et al. Abdominal and Cardiac Evaluation with Sonography in Shock (ACES): An approach by emergency physicians for the use of ultrasound in patients with undifferentiated hypotension. Emerg. Med. J 2009; 26:87-91.
10. Perera P, Mailhot T, Riley D, Mandavia D. The RUSH exam: Rapid Ultrasound in Shock in the evaluation of the critically ill. Emerg Med Clin North Am 2010; 28:29-56.
11. A Liteplo, V Noble, and P Atkinson. My patient has no blood pressure: point of care ultrasound in the hypotensive patient-FAST and RELIABLE. Ultrasound 2012; 20:64-68.
12. The Royal college of Radiologists: Ultrasound training recommendations for medical and surgical specialties, second edition. London: The Royal College of Radiologists, 2012.
13. Shackford SR, Rogers FB, Osler TM et al. Focused abdominal sonogram for trauma: the learning curve of nonradiologist clinicians in detecting hemoperitoneum. J Trauma1999; 46:553-562.
14. The College of emergency Medicine(2012): <http://www.collemergencymed.ac.uk/Training-Exams/Training/Ultrasound%20training/default.asp>
15. American College of Emergency Physicians: Policy statement on Emergency Ultrasound Guidelines 2008. www.acep.org/WorkArea
16. Blaivas M, Pawl R. Analysis of lawsuits filed against emergency physicians for point-of-care emergency ultrasound examination performance and interpretation over a 20-year period. Am J Emerg Med 2012 Feb; 30(2):338-41.