

ELECTIVE (SSC5b) REPORT (1200 words)

A report that addresses the above four objectives should be written below. Your Elective supervisor will assess this.

What is the difference between trauma management in London and in developing countries?

According to the World Health Organisation, about 90% of the burden of mortality and morbidity of trauma arises from low- and middle-income countries (LMICs). Recognising this disparity, WHO decided to release guidelines for essential trauma management that they felt would be able to be performed worldwide(1). It is interesting to note that though developed countries such as the UK have better technology and equipment, that was not the major factor determining the improvement in patient outcomes, rather it was the way trauma care services were organized. In London for example, each trauma team is led by a senior doctor and each member of the team has a specific role to play with regards to assessing and managing the patient. There is a system that is followed based on advanced trauma life support protocol and the team regularly undergo simulation training to enable them to understand and practice their roles in a safe environment for learning. On the other hand, according to the report by WHO, they observed that some hospitals in rural areas had General Practitioners handling trauma cases. Furthermore, some hospitals did not have all the specialty doctors available such that there were some nurses who handled airway management. Another important aspect that was severely lacking in developing countries was a system of transferring patients to the hospital. In London, the London Ambulance Service and Helicopter Emergency Medicine Service work hand-in-hand and effectively communicate with the trauma team in the emergency department enabling them to be prepared to receive the patients. In LMICs, relatives or whole communities often have to pool funds together to pay taxi drivers to take trauma patients to the hospitals in addition to the fact that hospital services aren't planned to be nationwide accessible meaning patients often have to travel long distances.

How much of a role does FAST scans (focused assessment with sonography for trauma) play in trauma assessment in the UK compared to other countries in the developing world?

A literature search conducted using the terms "focused assessment with ultrasonography for trauma", "trauma", "United Kingdom" and "London" revealed that there was very little documented studies on the use of FAST scans in UK. An early study done in the UK evaluating the integration of FAST scans into trauma investigation reported a significant specificity of 99% and a sensitivity of 78% for the detection of free fluid (2). A more recent study of FAST scans in blunt abdominal trauma carried out at the Royal London Hospital reported a specificity of 94.7% and a sensitivity of 46.2%.(3) The Royal College of Emergency Medicine and the Royal College of Radiologists have produced guidelines on setting up a framework for training in ultrasound (4) and a suggested algorithm for the use of FAST scans (5). Although I could not find any standard protocol already in place for the use of FAST scans in emergency departments online, during my time in the Royal London resuscitation department, I observed that FAST scans were regularly used with most trauma patients that presented, for both adults and children. For all of the patients I observed for which FAST scans were performed, they had negative scans, and were also investigated with CT scans as soon as stabilized. Centralised data on the usage of ultrasound in LMICs is equally poor though data exists from many studies that have been conducted in focused countries(6). Points of consideration with ultrasound in LMICs include the availability of

ultrasound machines, implementation of training for operators that meets the WHO standards, and maintenance of the machines. In the hands of trained doctors in a referral center for trauma in South Africa, the FAST scan had a specificity of 100% and an overall sensitivity of 71.4% when performed on patients who had sustained thoracoabdominal trauma with a noted higher sensitivity for picking up blunt trauma versus penetrating trauma(7). A recent survey in 2015 carried out across 44 LMICs recorded that FAST scans tied with cardiac evaluations as the second most common application of ultrasound. The survey also revealed that the major perceived barrier to the integration of ultrasound into clinical practice was the lack of training with 82% of respondents being keen to the idea of receiving long distance training.(8) Ultrasound in this aspect of emergency medicine can be really useful in quickly determining which patients need more serious investigations or surgical interventions, especially in the absence of CT scanning. A study carried out in Rwanda in 2008 (9) demonstrated that clinicians changed their management of patients in 43% of cases after undergoing an ultrasound training curriculum. Relevant to FAST scanning was the fact that these changes included less thoracocentesis and paracentesis procedures being carried out on patients when ultrasound findings were negative for fluid collections.

How much can the ultrasound contribute to clinical management of patients in the developing world?

Sippel et al(10) wrote an excellent review on the usage of ultrasound in the developing world. In it they identify several areas where ultrasound usage could significantly impact the precarious balance in LMICs between efficient use of limited resources and the delivery of optimum therapeutics that could change clinical outcome for each individual patient that presented. The first area is hemorrhage especially in obstetrics and trauma where blood transfusions can be equally life-saving but potentially hazardous. Caval Index (CI) and IVC diameter were found to be strongly correlated with shock and changed significantly with changes in blood volume (11, 12). Similarly with sepsis, resuscitation with IV fluids is an important early consideration and while the guidelines advocate achieving a central venous pressure (CVP) of between 8 and 12 mmHg(13), central venous catheters are not always readily available in LMICs. Once again, CI and IVC diameter have been studied and found to correlate well with CVP, as well as being useful for identifying patients that are fluid responsive(14, 15). The most common use of ultrasound in LMICs at the moment is in obstetrics where it can be used to help detect intrauterine growth retardation and factors precipitating risky births including non-vertex presentations of babies and multiple gestations. An approximate of one-fifth of midwives from African countries reported that the usage of ultrasound changed their clinical decision and management process (16, 17).

To gain exposure in the practical skills of using ultrasound in emergency medicine.

On describing the usage of ultrasound in emergency medicine (EM), the first application that comes to mind is the FAST scan. However, having the opportunity to carry out this elective has enabled me to widen my perception of the different ways ultrasound can be utilized in EM including in the clinical diagnosis of surgical conditions such as appendicitis and cholecystitis, aiding vascular or nerve block procedures and interventional drains and finally in assessing blood flow using Doppler. Furthermore, during my time researching for my presentation, I came across interesting new concepts including the holistic approach (HOLA) ultrasound assessment whereby a head-to-toe examination of

patients are carried out examining the different parts that are relevant to the individual patient's context and condition as well as different resources which are useful for learning more about the ultrasound including the website <https://sonoworld.com>. The ultrasound can be quite difficult to use depending on the region being examined. I realised during using it that ribs often obscure the view of the heart and gas in the bowel can obscure visualization of abdominal organs especially those that are retroperitoneal. Added to that is the fact that each individual's anatomy has a slight variation. It is interesting to observe how the ultrasound at the moment is more often a tool to rule in diagnoses than to rule them out. As with most imaging, pattern recognition is key, which comes with experience and is my aim for undergoing this elective.

WORD COUNT: 1200 words

References:

- 1. Organization WH. WHO Guidelines for Essential Trauma Care. Department of Injury and Violence Prevention. 2004;Geneva.**
- 2. Brenchley J, Walker A, Sloan JP, Hassan TB, Venables H. Evaluation of focussed assessment with sonography in trauma (FAST) by UK emergency physicians. Emerg Med J. 232006. p. 446-8.**
- 3. Simon Fleming RB, Kumaran Ratnasingham et al. Accuracy of FAST scan in blunt abdominal trauma in a major London trauma centre. 2012;10(9):470-4.**
- 4. Radiologists TRCo. Ultrasound training recommendations for medical and surgical specialties, Second edition | The Royal College of Radiologists 2012Review Date: 2015 [Available from: <https://www.rcr.ac.uk/publication/ultrasound-training-recommendations-medical-and-surgical-specialties-second-edition>.**
- 5. Medicine TRCoE. Core (Level 1) Ultrasound Curriculum2009. Available from: http://www.rcem.ac.uk/RCEM/Exams_Training/UK_Trainees/Ultrasound_Training/RCEM/Exams_Training/UK_Trainees/Ultrasound_Training.aspx?hkey=b0565712-6409-49b9-96c3-eafbda02a404.**
- 6. LaGrone LN, Department of Surgery UoW, Seattle, WA, USA, Sadasivam V, Department of Radiology SH, Salem, India, Department of Radiology AMCaH, Salem, India, Kushner AL, et al. A review of training opportunities for ultrasonography in low and middle income countries. Tropical Medicine & International Health. 2017;17(7):808-19.**
- 7. Smith ZA, Postma N, Wood D. FAST scanning in the developing world emergency department. S Afr Med J. 2010;100(2):105-8.**
- 8. Shah S, Bellows BA, Adedipe AA, Totten JE, Backlund BH, Sajed D. Perceived barriers in the use of ultrasound in developing countries. Crit Ultrasound J. 2015;7(1):28.**

9. Shah SP, Epino H, Bukhman G, Umulisa I, Dushimiyimana J, Reichman A, et al. Impact of the introduction of ultrasound services in a limited resource setting: rural Rwanda 2008. *BMC Int Health Hum Rights*. 92009. p. 4.
10. Sippel S, Muruganandan K, Levine A, Shah S. Review article: Use of ultrasound in the developing world. *International Journal of Emergency Medicine*. 2011;4(1):72.
11. Lyon M, Blaivas M, blaivas@pyro.net, Brannam L. Sonographic measurement of the inferior vena cava as a marker of blood loss. *The American Journal of Emergency Medicine*. 2005;23(1):45-50.
12. Nabavizadeh SSARA. Sonographic measurement of the inferior vena cava as a predictor of shock in trauma patients | SpringerLink. *Emergency Radiology*. 2007;14(3):181-5.
13. Dellinger RP CJ, Masur H, et al. Surviving Sepsis Campaign Management Guidelines Committee. Surviving Sepsis Campaign guidelines for management of severe sepsis and septic shock. *Crit Care Med*. 2004;32(3):858-73.
14. Teboul MFMa-PF-L. The respiratory variation in inferior vena cava diameter as a guide to fluid therapy | SpringerLink. *Intensive Care Medicine*. 2004;30(9):1834-7.
15. Kircher BJ, From the University of California SF, U.S.A., From the Division of Cardiology JHMELUSA, Himelman RB, From the University of California SF, U.S.A., From the Division of Cardiology JHMELUSA, et al. Noninvasive estimation of right atrial pressure from the inspiratory collapse of the inferior vena cava. *American Journal of Cardiology*. 1990;66(4):493-6.
16. Kimberly HH, hkimberly@partners.org, Department of Emergency Medicine BWSH, Boston, MA, USA, Murray A, Department of Emergency Medicine TNRI, Edinburgh, UK, Mennicke M, et al. Focused Maternal Ultrasound by Midwives in Rural Zambia. *Ultrasound in Medicine and Biology*. 2010;36(8):1267-72.
17. Stein W, Katunda I, Butoto C. A two-level ultrasonographic service in a maternity care unit of a rural district hospital in Tanzania. *Tropical Doct*. 2008;38(2):125-6.