Can simulation training replace initial clinical teaching for doctors learning transvaginal ultrasound?

Lay Summary
The MedaPhor transvaginal ultrasound simulator will be compared with clinical teaching to assess whether it can adequately teach radiology and obstetric/gynaecology registrars and foundation year 2 doctors the basic components of a transvaginal ultrasound scan. All participants will undertake an initial assessment on the simulator to provide baseline data and allow them to be allocated to either the simulator or clinical teaching group according to their job and scanning ability. They will then undergo ten hours of training in transvaginal ultrasound using the allocated teaching method. All participants will then complete a final assessment incorporating 2 cases on the simulator. Areas assessed will include adequate assessment of anatomy, accuracy of measurements, image quality, correct orientation, time taken to complete and the ability to differentiate between normal and abnormal. The results from both groups will be analysed to establish if the participants have reached a comparable level of ability. All participants will then be allocated to one of three focus groups, where topics covered will include simulator realism, case selection and opinions of simulation training. The key themes identified in the focus groups will be analysed to establish if they can explain the final assessment results.

This project does not propose that achieving a high score in the final assessment directly correlates with being able to perform a good scan on a real patient. It merely aims to identify if the simulator is able to adequately teach some of the basic components that make up a transvaginal scan.
PRINCIPAL AIM OF THE STUDY: To compare the use of the MedaPhor transvaginal (TV) ScanTrainer ultrasound (US) simulator with clinical teaching for teaching radiology and obstetric/gynaecology doctors the basic components of a TV gynaecological US scan.

PRIMARY RESEARCH QUESTION: Does the TV US simulator provide novice scanners with the ability to adequately examine all of the required anatomy and correctly distinguish between normal and abnormal appearances (when compared with standard clinical training)?

SECONDARY RESEARCH QUESTION: Does the TV US simulator allow novice scanners to gain sufficient experience to ensure confidence in ability to progress to standard clinical scanning on patients?

OUTCOMES:
- To establish whether or not training using the MedaPhor TV ScanTrainer US simulator could be a viable alternative to clinical teaching when learning the basic components of a TV US scan.
- To assess if training using the MedaPhor TV ScanTrainer US simulator provides novice scanners with sufficient experience to ensure confidence to progress to TV US in the clinical environment.

REVIEW OF THE LITERATURE:
US scans form a consistently large percentage of the imaging examinations requested in hospitals due to the safety of the equipment and its easy availability (Monsky et al, 2002, p. 35). Yet, in order to perform a scan the operator must be adept at both the “technical aspects of scanning and the interpretive skills of sonography” (ibid). Consequently, US is considered very operator-dependent and with few doctors attending basic US courses a gap is forming between the techniques available and those able to use them (Salvesen et al, 2010, p.529).

Due to the high demand, a rapid throughput is necessary within an US department and this limits the number of teaching sessions that can be provided to doctors. This has been further exacerbated by the mandatory time restrictions now placed on in-hospital work for speciality trainees, which has limited the time they have available to train in different areas (Gould et al, 2006, p. 215). In addition, it has long since been recognised that where gynaecological US is concerned, sonographers play a substantial role in teaching new doctors (The Royal College of Obstetricians and Gynaecologists, n.d). However, “there is a UK wide shortage of sonographers” (Society and College of Radiographers, 2009) and US departments are struggling to meet government targets such as those laid out in the National Health Service (NHS) Plan (DoH, 2000) and undertake obstetric and vascular screening programmes (NHS Abdominal Aortic Aneurysm screening programme, 2009; National Screening Committee, 2007; NHS Fetal Anomaly Screening Programme, 2010). Consequently, this leaves little time for sonographers to actively participate in training doctors in gynaecological US.

TV US is now the most routinely requested imaging examination for gynaecology referrals (Heer et al, 2004, p. 440). However, due to its invasive nature it is a particularly difficult skill to learn as patients are less willing to tolerate long examinations times due to an inexperienced operator (Monsky et al, 2002, p. 35). This in addition to the economic issues stated above has resulted in TV US becoming a difficult area for doctors to learn.

Over recent years, the potential of simulation-based medical education to increase the clinical competencies of medical professionals has become increasingly acknowledged (Monsky et al, 2002, p. 35). This was noted in particular in a directive written by the Chief Medical Officer Sir Liam Donaldson in 2009. The use of simulation has proved successful in other industries such as aviation and is already routinely used in medicine for basic clinical skills such as suturing (Donaldson, 2009, p. 51). With a view to extending the use of simulation throughout medical education each royal college was required to appoint a director for simulation training (ibid). As a result, both the Royal College of Radiologists (RCR) and the Royal College of Obstetricians and Gynaecologists (RCOG) are now currently focused on developing their resources in simulation based training (RCR, 2010, p. 2; RCOG, 2009).

“A simulator is a physical object that reproduces, to a greater or lesser degree of realism, a medical procedure that must be learned, and that incorporates a system of metrics that allows progress and learning to be recorded” (Dawson, 2006, p. 19). The development of US simulators with built-in virtual examinations have made standardised US training and assessment possible and could represent a new era in US education (Maul et al, 2004, p. 585). Whilst previous research has demonstrated improvements with simulation training in areas such as detecting fetal anomalies using US (ibid), with the constant development of new US simulators more up to date research is required.

In April, 2010 MedaPhor unveiled a new haptic TV US training simulator, which breaks down learning into modules with “easy-to-follow tutorials and assignments” allowing the operator to learn through trial and error (MedGadget, 2010). The use of a force-feedback (haptic) device increases the realism of the simulator and it enables the user to experience “real-time physical feedback of probe manipulation and contact with a patient” (ibid). This product has the potential to
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