Tele-Ultrasound: Virtual Hands-on Medical Education for Novice Users Utilizing FAST & Carpal Tunnel Models, Pilot Study

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Ultrasound (US) training is an emerging tool, utilized to enhance anatomy education in medical schools with preliminary incorporation into non-medical anatomy courses. The need for distanced, virtual, education has always been present with an exponential increase in demand due to COVID-19. Recent developments in point-of-care-ultrasound (POCUS) have enabled relay of remote imaging and communication, Tele-US. This pilot study aims to assess whether the integration of virtual self-paced modules and virtually guided (VG) ultrasound sessions, utilizing the Butterfly iQ (BiQ) US device, is as effective as in-person (IP) learning for novice users.

Study sessions included three, 30-minute modules: Introduction, Carpal Tunnel (CPL-T), Focused assessment with sonography in trauma (FAST). Live hands-on active learning sessions utilized CPL-T and FAST modules where groups of 2-3 participants performed peer-peer scanning. Hands-on guidance was given to IP groups, whereas VG groups received guidance through the BiQ Tele-guidance software (TGS). The TGS provides remote video conferencing, real-time imaging relay for simultaneous viewing by the operator and educator, educators ability to remotely change settings, and the integration of augmented reality to provide visual cues to the operator on screen. 7 first-year medical and 19 Modern Human Anatomy students (N=26) were invited to participate in the IRB-exempt pilot study. Pre- and Post-study online surveys were used to collect data on previous US training utilizing multiple choice questions and self-perception of confidence levels US skill and usefulness of the BiQ US system. Perceptions were assessed utilizing a 5-point Likert scale (1= strongly disagree/not useful/extremely difficult, 5= strongly agree/extremely useful/extremely easy). Additionally, a 17-point assessment was administered IP by staff to participants in a random order on 4 key anatomical regions; median nerve, radial artery, hepatorenal recess, and thorax to assess participant US skill levels at the end of the live session. Feedback provided to participants after the assessment period was completed for all participants.

Two-way t-tests were used to assess post-study ratings and assessment scores. Pre- and post-study survey response rates were 96% (13 IP, 12 VG) with roughly equal gender distribution. Comparison of post assessment survey did not show a significant difference (SD) in self confidence levels ($P>0.05$) between the groups across all 5 prompts: ease of CPL-T/ FAST, usefulness of BiQ, confidence in displaying CPL-T/FAST. Further, a SD in scores during the live session assessment was not observed (IP average= 10 ±3.49, VG average= 10.6 ±2.66; $P=0.62$). Detailed analysis was not performed due to the limited sample size of the pilot study.

Perceived confidence and assessment scores do not differ when comparing traditional POCUS to Tele-US using BiQ for novice users, suggesting that medical students can demonstrate equal competency levels when undergoing distanced US education as IP courses. Yet, further testing is required to expand the sample size and test in-group variances.