

Feasibility of Ultrasound Integration into Medical Education in a Limited Resource Setting in Lebanon

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Objective: To assess the feasibility of integrating ultrasound into the medical education of the first year medical students in a limited resource setting at the University of Balamand in Lebanon, the first such attempt in the Middle East.

Methods: This was a combined effort of an obstetrician and a biomedical engineer, with the full support of the Dean of the medical school. There were limited resources available in terms of clinical faculty for the training of the students, machinery and the allocated time in an already packed curriculum. The obstetrician trained with a radiologist and a cardiologist to acquire the basic skills for scanning the various regions. The course included a total of 6 sessions: 2 didactic sessions and 4 practical labs. The learning modules of the Society of Ultrasound in Medical Education were assigned to the students prior to each of the 4 practical sessions: neck and thyroid, liver and gallbladder, kidneys and spleen and finally the heart. A single ultrasound machine was purchased, and the 68 students were divided into 8 groups for each of the 4 labs carried over four full days. The students served as the models. In addition, there was an "open" lab for the students to practice their skills and a written examination at the completion of the course.

Results: A total of 68 students participated in the course with attendance well over 95% in 5 of the 6 sessions, and 80% in one of the sessions (the day preceding a major examination). The students described this experience as "the highlight of their first year" with much enthusiasm expressed, requests for more training, and clear skill demonstrated during the labs with good assimilation of the basic principles covered in the course. This was exemplified by a mean test score of 69.3 % (range 25-100%) on the written examination at the end of the course.

Conclusion: Once a passionate core team is available, despite the limited resources available, it is feasible to introduce ultrasound into the medical curriculum at the first year level. This then acts as the catalyst to secure both the clinical faculty, as well as the technical resources, to further build on this experience and work on integrating ultrasound into all four years of medical education as has been our case at the University of Balamand in Lebanon.

**First Year Medical Students' Perceptions of the Importance of Ultrasound
in Medical Education in Lebanon**

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Objective: To evaluate first year medical students' perceptions of the importance of ultrasound in medical education pre- and post-implementation of the first ultrasound course in the Middle East.

Methods: Responses to pre- and post-course surveys from 68 first year medical at the University of Balamand in Lebanon were collected. The ultrasound course was carried out at the end of the first year of medical education. The students were asked to respond, using a 5-level Likert scale, whether they felt ultrasound: enhanced their understanding of anatomy, physiology, was beneficial and should be integrated into all 4 years. In addition, the students were asked whether they believed they would use ultrasound in the future, whether ultrasound education should be universal, whether the experience was positive and whether they would be willing to become "future instructors" to their juniors in ultrasound training. The data was analyzed using t-test and descriptive statistical approach. $P \leq 0.05$ was considered statistically significant.

Results: The response rate was 63/68 (92.6%) for the pre- and 64/68 (94.1%) for the post-course surveys. Analyzing the pre- and post-course results demonstrated that of the students, 87.3% pre- and 87.5% post-course agreed/strongly agreed that ultrasound would enhance their understanding of anatomy. However only 57.1% of the students, both pre- and post-course, agreed/strongly agreed that ultrasound would enhance their understanding of physiology. There was a statistically significant difference in the students' responses, pre- and post-course, with respect to: ultrasound being beneficial, mean scores of 4.41 pre- and 4.76 post-course ($p=0.002$), the need for ultrasound integration into all 4 years, mean scores of 3.81 pre- and 4.83 post-course ($p=0.000$), the need for universal ultrasound integration, mean scores of 4.3 pre- and 4.83 post-course ($p=0.000$), foreseeing using ultrasound in their future clinical practice, mean scores of 4.48 pre- and 4.68 post-course ($p=0.05$), and rating ultrasound as an overall positive educational experience, mean scores of 4.33 pre- and 4.75 post-course ($p=0.001$). Of note is that out of 63 responding students, 79.7% agreed/strongly agreed to becoming "future instructors" to their juniors in ultrasound training.

Conclusion: As our study demonstrates, ultrasound integration into medical education is a most positive experience for the first year medical students serving to enhance their basic knowledge of anatomy. Their strong belief in ultrasound's clinical applicability in their future practice, the need to integrate it at all 4 years of medical education, and the need for its universal implementation, together with their willingness to serve as future instructors to their juniors, provides further evidence in support of the importance of global implementation of ultrasound in medical education.