

Need of Integrating Sonoscopy in Undergraduate Medical Education in Developing Countries

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ABSTRACT

Early exposure to technical knowledge improves dexterity and encourages ingenuity. We see the role of ultrasound as a “sonoscope”. Use of sonoscope improves anatomical understanding and improves virtual image interpretation (mind’s eye). Early sonoscope use does not interfere with learning physical examination rather it improves one’s sensitivity as one sees what lies underneath one’s hand. Sonoscope is being used by various medical specialities not only to make diagnosis, but also to monitor and guide interventions. Medical schools worldwide have realised the need and relevance of sonoscope in medical curriculum and hence this needs to be integrated in undergraduate medical education in developing countries.

Keywords: Medical education; point of care ultrasound (POCUS); sonoscope

INTRODUCTION

In the last 2 decades there has been a tremendous improvement in medical technologies. However, with newer modalities of diagnosis, the complexities of handling and interpreting the findings have become even more challenging. Our experiences in the past have shown early introduction to the technology improves adaptability and dexterity with the gadgets. It is not so a distant past when we used to be perplexed with the complexity of typing on computers or using our smart phones when these machines were first introduced! And now working on them look so simple that a person not knowing these would be considered an illiterate!

INTRODUCTION TO SONOSCOPE

Ultrasound was introduced in medicine in 1941 when Austrian neurologist Karl Theo Dussik in collaboration with his brother, Friedreich, a physicist, outlined the ventricles of a human brain.¹ Professor Ian Donald and colleagues at the Glasgow Royal Maternity Hospital (GRMH) first used ultrasound for obstetrics applications.² As a diagnostic tool it soon became the most common performed tests by radiologists. Driven by the demands of the radiologists, the gadget and its software were designed to notify and calculate on-screen objects. These improvisations made the ultrasound machine look very complicated considering the number of keys and functions available on the present-day ultrasound

machine with cutting edge technology. This mystified the whole science of ultrasonography and except for few specialties like gynecology and cardiology, ultrasound remained a tool largely to be used by radiologist. However, this isolation from the power of this awesome tool did not continue for long as the clinicians soon realized the diagnostic as well as resuscitative value of the ultrasound. Gradually as we started to understand how to use this powerful gadget for answering the clinical question, we see the role of ultrasound as “sonoscope” similarly to a stethoscope with a difference that rather than the sound to hear here we have images to see! By calling it a “sonoscope” we can introduce the concept of “Point of care ultrasound” (POCUS) where clinicians would be performing “sonoscopy” rather than radiologist to answer clinical question rather than detailed organ-based evaluation by a radiologist. This would expedite the health care delivery particularly in emergency situations and decrease the burden on the small number of radiologists whose services are available only during office hours and in urban areas. We would like to reserve the term “ultrasonography” as ultrasonographic evaluation performed by radiologists who are dedicatedly trained for 3 years in this modality.

ALTERNATIVE TO HEAVY DUTY ULTRASOUND MACHINES

Point of care, portable ultrasound systems are now low-

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cost, hand-carried devices generating reliable images with a rapidly growing number of indications in various specialties and for primary care physicians. Moreover, these systems have been shown to be better than relying on surface landmarks to guide invasive procedures and therefore decrease complications.

WHO ELSE ARE USING THE SONOSCOPE?

Besides being used for diagnostic gynecological procedures, with the introduction of a systematic way to approach patients with trauma as in ATLS (advanced trauma life support) protocols, surgeons realized a new way to diagnose instantly possibility of bleed inside abdomen or pelvis while resuscitating simultaneously. Gradually this gadget found this new found use in chest and neurological assessment. Now all over the world this gadget of the millennium, is being rampantly used in differently clinical specialties not limited to emergency physicians, intensivists, gastrointestinal surgeons, orthopedics, ENT surgeons and even neurosurgeons. Sonoscope have found it's increasing role in navigating surgeons and indicate adequateness of surgical resection or procedures.

IF THE SONOSCOPE HAS SUCH AN IMMENSE USE, THEN WHY NOT START EARLY?

Undergraduates in medical schools are posted in radiology department and do have some exposure about ultrasound, but since they are not using it daily they remain skeptical about its uses. Moreover, during radiology posting, they remain more occupied with X rays and CT scan studies. Sonoscopy being operator dependent demands hands-on experience rather than just lectures or observation. Hence it would be useful if hands-on experience is introduced early along with didactic lectures and video demonstration.

ANY EVIDENCE THAT EARLY INTRODUCTION TO SONOSCOPE WOULD HELP?

By understanding ultrasound images one can have better idea of the organ system which are not visible from outside and need mind's eye to visualize the same in 3D. This shall not only help in understanding anatomy but also help in performing better physical examinations. This has been shown convincingly by Butter et al, who found a significant improvement in 1st year medical students who received early ultrasound training in their ability to perform abdominal examinations after using ultrasound as an adjunct as compared to those in whom ultrasound training was delayed and hence used traditional methods of learning initially.³ This

also dismisses the concern of educators who believe that by using such gadgets shall deteriorate physical examinations skills of the student with the pretext that they would prefer to use ultrasound rather than try and believe their senses.

HOW IT HELPS IN BASIC YEARS OF MEDICAL SCHOOL?

Helping learn gross anatomy

Learning anatomy have seen transformation. Sonoscope allows effective visualization as a method of "virtual dissection" or "living anatomy"⁴. To see functional live anatomy like heart, vessels and bowels 'moving' students consider this modality both "*exciting and engaging*". In 2005 Tshibwabwa et al from McMaster University found a clear improvement in students' results and satisfaction by introducing ultrasound in the study of anatomy.⁵

Specific role in understanding specific organ system

Medical students usually complain about no practical relation of their anatomical classes with practical real life. Wicke et al introduced an experimental teaching module of the anatomy of the abdomen and pelvic organs, which included the simultaneous US visualization of the same areas (1st to 6th years students). The results were spectacular: 93% of the students considered the course very important for their training, while 96% wanted similar courses, which made the faculty promote them further.⁶ Literature is abundant on how sonoscope by providing extremely positive feedback (a didactic tool) appears to be an ideal method of supporting education in cardiology, abdomen, pelvis, blood vessels, musculoskeletal anatomy and rheumatology.^{5,6}

Teaching basics of physical examination

Hand carried ultrasound devices have extended the use of sonoscope of the like of doing physical examination by stethoscope by letting the students see what they are palpating!

NEED OF TRAINING PROGRAM/ CURRICULUM

Unfortunately, most university medical centers do not have a structured environment to train healthcare providers to develop scanning and pathology recognition skills. We must avoid a case of technology spreading faster than the expertise to use it. Hence students should be guided to explore the capabilities of point of care ultrasound and the experience/opportunity of introducing this technology at the undergraduate level.

We should employ ultrasonography simulators so that participants benefit from a hands-on experience.

However, a minimum competence level is required to harness the benefit of visual feedback of the ultrasound as was shown by Butter et al who showed improvement in confidence level in performing clinical examinations towards the end of first year of medical education rather than when exposed at an early stage.³

PRESENT STATUS OF “SONOSCOPE” WORLD WIDE

Many academic institutions and learners value the early introduction of ultrasonography skills to medical students.³⁻⁵ Indeed, for the last decade ultrasonography has been promoted as the “stethoscope (sonoscope) of the future,”⁷⁻¹¹ impacting clinical decisions after appropriate training in its use as a point-of-care device.¹²⁻¹⁴ Our study has proven effectiveness of short courses in medical graduates.¹⁵

Medical education is in constant phase of change as is process of teaching and learning at a speed of development in knowledge, teaching methodology and its related tools of the likes of simulation, virtual depiction and use of static or dynamic images.¹⁶

In 1996 Hannover Medical School became the first in teaching anatomy using ultrasound and a decade ago, University of South Carolina, school of Medicine introduced an entire medical university curriculum integrating ultrasound (2006-2011).¹⁶

THERE ARE FEW CONCERNS!

However there always exist few concerns with universal training in sonography, particularly misuse of the ultrasound to determine fetal sex and over confidence with the diagnosis and intervention with little experience with sonography. As a community all doctors are bound by medical ethics and any such mistake and wrong doing are punishable by law.

In the survey of 36 educators, Ma et al have found ultrasound-aided physical examination teaching could have deleterious effects if used outside its intended scope. Examinations that are potentially the most useful may also be potentially the most harmful.¹⁷ Hence such training should be systematic and supervised.

OUR PROPOSAL

We propose to introduce sonoscope in medical school starting in 1st year of medical education.

After a brief introduction on mechanics and how to interpret images, students can be taught how to use sonoscope for the study of organ. This we believe is possible in our curriculum, as our problem-based learning course in first 2 years of medical school are organ based. In the 3rd and 5th year, student can be taught how to answer clinical question of shock and cyanosis, how to use sonoscope for intervention and resuscitation as well as use of echocardiography. During the internship, students can use sonoscope in their clinical dealings with the patients under supervision of the tutors/clinicians. Besides using modalities of lectures or demonstration, laboratory sessions as well as web-based learning modules can be used. Integrated ultrasound curriculum is used in medical undergraduate courses and have been verified to be of an advantage.¹⁸

In post graduate and super specialty programs not limited to Internal Medicine, Anesthesia, General Surgery, Gynecology, Pediatrics, Orthopedics, Accident and Emergency, Neurosurgery, Urology, Cardiology and Cardio thoracic Surgery, a structured and focused course of sonoscope can be introduced to teach the students of its diagnostic and therapeutic potentials.

BRIDGING THE GAP

To bridge the present knowledge gap, the Department of Neurosurgery along with Department of surgery, Anesthesia and Radiology at Kathmandu Medical College Teaching Hospital (KMCTH) started KUTLS program (KMCTH ultrasound trauma life support courses)¹⁵ which became a favorite among the post graduates and over 200 doctors have been trained in 6 sessions over the last 5 years. Nepal Medical Association also took interest and had introduced similar program in past years in Nepal Medical College Teaching Hospital. A study by our team has showed interest and change in attitude with exposure to sonoscope during training programs.¹⁵ However, we need to understand that learning is a continuous process and dexterity cannot be attained in a one-day course. Sonoscope is a gadget and sooner we get exposed to its potential better we would be in its application.

CONCLUSIONS

As we are stepping into a new era of Medical science with quality education and care in Nepal, time is ripe to introduce integrated sonoscope based curriculum in medical graduate courses as well as nursing bachelor courses. In United States as well as Europe, sonoscope has already make significant impact in teaching concepts and have led to reconsideration of curricula and syllabi in medical schools.⁴

We highly recommend introduction of sonoscope in medical schools both in undergraduate as well as post graduate courses.

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