

### **Supplementary material**

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**Appendix. Results of the survey conducted by the Asian Federation of Societies for Ultrasound in Medicine and Biology (AFSUMB) regarding undergraduate ultrasound education within the AFSUMB-affiliated societies**

**Ultrasound training for medical students**

*Mainland China*

One to two credits (16-18 class hours per credit) of ultrasonic diagnosis and medical physics were included in the clinical medicine major curricula of medical schools. In addition, approximately 109 medical schools have established the undergraduate specialty of medical imaging, which focused on radiology and provided three to five credits of ultrasonic medicine courses. There was also some supporting ultrasound diagnostics teaching materials, which enabled students to develop more comprehensive understanding of ultrasonic medicine from the basics through to its clinical application. Many of these students have become ultrasonographers in district and county hospitals. A few medical schools were also exploring more specialised undergraduate-level ultrasound medicine education.

*Hong Kong*

The University of Hong Kong integrated ultrasound into the undergraduate medical curriculum. In preclinical years, anatomy and physiology education through ultrasound was provided in collaboration with the Division of Anatomy. During clinical rotation, hands-on workshops in ultrasound workshops were provided by the Department of Diagnostic Radiology. A structured ultrasound module introduced students to point-of-care ultrasound (POCUS) and also provided access to an e-learning platform for continuing education.<sup>1</sup> Similarly, The Chinese University of Hong Kong introduced an ultrasound education programme for final-year medical students<sup>2</sup> and provided pocket-sized ultrasound devices and an ultrasound e-learning module to enhance their learning.<sup>3</sup>

*India*

Because of male sex preference in Indian communities, the Government of India enacted the rigid Preconception and Prenatal Diagnostics Techniques (Prohibition of Sex Determination) Act 2003. This act effectively prohibits the use of ultrasound machines by medical students, technicians, and nurses. In 2014, recognising that there was a need to train more doctors in the use of ultrasound, the Indian government amended the act and introduced a 6-month training course in ultrasound. However, no institute has introduced structured ultrasound teaching as part of the undergraduate curriculum until recent years. At least three medical universities have started including

ultrasound exposure to undergraduates as part of their clinical rotations from the third year, but this is strictly observational as they are not allowed any hands-on training due to the existing law. The majority of ultrasound teaching was provided as part of the postgraduate curricula in radiology, obstetrics and gynaecology, and cardiology, and at other postgraduate teaching institutes.

### *Japan*

The number of medical schools or colleges where systematic ultrasound education was provided was quite limited. The Safety Committee and Education Committee of The Japan Society of Ultrasonics in Medicine are now jointly beginning to develop a curriculum of ultrasound education for medical students.

### *Singapore*

Ultrasound training was provided at two of the three medical schools but to varying extents. Formal training in ultrasound was provided at one medical school that extends through all five years. The students receive hands-on ultrasound training on phantoms from Year 1, followed by more detailed training in Year 2. During the clinical years (i.e., Years 3-5), there are combined sessions with emergency department physicians and cardiologists. Training was disrupted due to the coronavirus disease 2019 pandemic and has now restarted for Years 1 and 2. The curriculum is also currently being refreshed. At another medical school, hands-on training in ultrasound was provided as part of the anatomy curriculum during Years 1 and 2.

### *South Korea*

Formal ultrasound education was not an essential component of medical education until recent years. The radiology departments of universities taught the principles and characteristics of ultrasound and its indications in comparison with other imaging modalities. Many ultrasound images were presented in selected cases of diseases during lectures, clinical conferences, and bedside teaching. Students were allowed to observe but could not perform ultrasound examinations, although being allowed to undertake ultrasound examinations using phantoms or by acting as volunteer patients for each other.

### *Taiwan*

The Department of Medical Imaging and Radiological Sciences (MIRS) of 10 universities or colleges has provided a formal course. The Taiwan Society of MIRS has close relationships and collaborates with several government organisations. Formal examinations on the subject of ultrasound imaging were included in the National

Licence Examination. In one medical school, an elective course on POCUS was offered to medical students but only 22% (33/150) took it because of the tight curriculum and the insufficient number of teachers and ultrasound machines. There was also a 36-hour elective course entitled 'Ultrasound Laboratory' for undergraduates of MIRS.

#### *Thailand*

One day of obstetric ultrasound education was provided to 6th-year medical students during their attachment to the maternal and fetal medicine unit of a university hospital. Basic use of an ultrasound machine for assessment of gestational age and determining the position of the fetus and the placenta was taught.

#### *Vietnam*

Ultrasound was only taught to medical students or radiologists until recent years. Ultrasound education was mainly designed for postgraduate students who chose radiology as their specialty.

### **Ultrasound training for allied health students**

#### *Mainland China*

Ultrasonographers and radiographers received systematic ultrasound education during their college years. Imaging technologists received elementary ultrasound training only. Nurses received only an introduction to ultrasound medicine (4-8 class hours) in the health assessment course. Some medical schools developed undergraduate courses for the training of ultrasound technicians. The Shanghai University of Medicine and Health Sciences has provided a certificate class for ultrasonic medicine since 1988. Moreover, they have taken the lead in compiling the medical imaging technology textbooks *Ultrasound Diagnostics* and *Ultrasound Examination Technology*. In 2016, the West China Medical Center of Sichuan University began to set up a 4-year undergraduate course in medical imaging, established a professional training programme for ultrasonic technicians, and thus helped solve the shortage of ultrasound professionals in China. Since 2015, the National Medical Imaging Technology Undergraduate Practice Skills Competition has been held every year to promote and consolidate the theoretical knowledge and operational skills of students in ultrasound.

#### *Hong Kong*

Ultrasonography is one of the professional subjects in the Bachelor of Science in Radiology course provided by The Hong Kong Polytechnic University. Ultrasound education was provided by The Chinese University of Hong Kong through a certificate course on practical obstetric ultrasound for student midwives in the curriculum of the

Master of Science in Obstetric and Midwifery Care degree.

### *Singapore*

Postgraduate ultrasound courses at the Singapore Institute of Technology were offered to radiographers, ultrasonographers, and other healthcare professionals who perform clinical ultrasound.

### *South Korea*

There is no ultrasonographer system, as all ultrasound examinations are performed by medical doctors. Even though some technologists and nurses may perform ultrasound examinations, such as simple measurements in some situations, the results of these must be confirmed by medical doctors who take all responsibility.

### *Taiwan*

Students in the Department of MIRS qualify as radiographers or ultrasound technologists after passing the National Licence Examination, but their clinical examination reports must be endorsed by physicians. They have the option to select the 1-credit course of 'Ultrasound Laboratory' in the third year, in which basic physics and the principles of diagnostic ultrasound, instrumentation, and its clinical applications are taught. Each student in the department must rotate as an intern for a total of 24 weeks (and the remaining 12 weeks in the departments of radiation therapy and nuclear medicine, with  $\geq 4$  weeks in each department). Students must observe ultrasound at the bedside and practise using phantoms for 1 week during their rotation in the department of radiology. The Taiwan Society of Ultrasound in Medicine (Chinese Taipei Society of Ultrasound in Medicine) provides 8 to 16 hours of multidisciplinary lectures for physicians each year, covering the application of ultrasound in neurology, the head and neck, cardiology, the respiratory system, the breast, the gastrointestinal system, the urinary system, obstetrics and gynaecology, and the musculoskeletal system, as well as general ultrasound for radiologists and general ultrasound for technologists.

### *Vietnam*

Medical technologists received little ultrasound education because they do not perform ultrasound examinations at hospitals.

## **References**

1. Prosch H, Radzina M, Dietrich CF, et al. Ultrasound curricula of student education in Europe: summary of the experience. *Ultrasound Int Open* 2020;6:E25-33.
2. Nelson BP, Narula S, Argulian E, Bhagra A, Narula J. Including insonation in

- undergraduate medical school curriculum. *Ann Glob Health* 2019;85:135.
3. Moore CL, Copel JA. Point-of-care ultrasonography. *N Engl J Med* 2011;364:749-57.