

重點式照護超音波 (POCUS, Point-of-Care Ultrasound) 於畢業後醫學課程之整合與分析：彌合教育和臨床實踐之間的差距

A Comprehensive Analysis of Point-of-Care Ultrasound Integration into Postgraduate Medical Curriculum: Bridging the Gap between Education and Clinical Practice

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Background

Point of care ultrasound (POCUS) is an essential tool in modern medicine that has revolutionized the way clinicians diagnose and manage patients. POCUS can be used to diagnose a wide range of conditions, including cardiac, pulmonary, abdominal, and musculoskeletal disorders. The incorporation of POCUS into medical education has also been shown to improve clinical decision-making and patient outcomes.

The primary objective of this study was to investigate the current utilization and cognitive aspects of point-of-care ultrasound (POCUS) among postgraduate physicians. Additionally, the study aimed to establish and enhance POCUS curriculum education within a tertiary teaching hospital.

Methods

This is a pilot study to assess the feasibility and student response of introducing basic and advanced POCUS curriculum into PGY education. The course curriculum was conducted by the National Cheng Kung University Hospital, College of Medicine, National Cheng Kung University, Taiwan (NCKU) from 2020 January to December. It was structured as a half-day course equivalent and was implemented during weekend as an elective course, targeting mainly PGY physicians.

Result

There were 117 physicians joining the POCUS training during 2020. The participants in POCUS training exhibit a diverse range of characteristics. (Table 1) The majority, comprising 65.8%, are at the PGY level of medical training, while 34.1% are residents, and a minimal 0.1% are attending physicians. In terms of previous ultrasound training, 35.0% engage in self-practice, 12.8% have never received training, and 48.7% have had less than 10 hours of training. The frequency of clinical ultrasound use varies, with 42.7% using it several times a month and 26.5% several times a week. Regarding equipment availability, 16.2% have sufficient and readily available machines, while 59.8% experience a short wait for available equipment.

The clinical purposes for ultrasound implementation varied, with a predominant 55.7% employing it for bladder exams, 17.1% for CVC (Central Venous Catheter) and FAST (Focused Assessment with Sonography for Trauma), and 14.2% for hydronephrosis. (Table 2)

After joining the POCUS training, the majority of participants demonstrated a high level of mastery, in Urologic POCUS, Chest POCUS, Cardiac POCUS, Hepatobiliary POCUS, and FAST, with 83.8% to 84.2% falling within the 7 to 9 out of 10. (Figure 1)

Conclusion

In conclusion, this study illuminates the diverse backgrounds and experience levels of POCUS training participants, underscoring the need for tailored educational approaches. Furthermore, it emphasizes the varied applications of ultrasound in clinical practice, with equipment availability playing a pivotal role. The results suggest a generally high level of competence among participants in comprehending ultrasound principles and operations across specified medical domains, reinforcing the importance of POCUS integration in postgraduate medical education for improved patient care.

Table 1. Characteristics of participants (N=117)

Characteristics	Number (%)
Level of Medical Training	
PGY	77 (65.8)
Residency	38 (34.1)
Attending physicians	1 (0.1)
Previous ultrasound training	
Self-practice	41 (35.0)
Never	15 (12.8)
Less than 10 hours training	57 (48.7)
More than 10 hours training	4 (3.5)
Frequency of clinical ultrasound use	
Several times a year	25 (21.4)
Several times a month	50 (42.7)
Several times a week	31 (26.5)
Everyday	6 (5.1)
Seldom	5 (4.3)
Equipment available in clinical work	
Sufficient, and it is readily available	19 (16.2)
Available, but a short wait is required	70 (59.8)
Available machines but it takes a long time to wait	11 (9.4)
There are machines but not enough	14 (12.0)
No machines at all	3 (2.6)

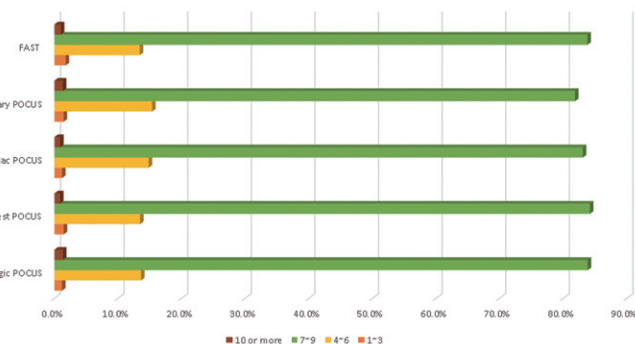
Table 2. Purpose of clinical use of POCUS (%)

Clinical purpose	N=70
CVC (Central venous catheter)	12 (17.1%)
Bladder exam	39 (55.7%)
Ascites	22 (31.4%)
Intraabdominal bleeding	3 (4.2%)
Gall bladder	1 (0.4%)
Pleural effusion	7 (10.0%)
IVC (Inferior Vena Cava)	4 (5.7%)
Hydronephrosis	10 (14.2%)
FAST (Focused assessment with sonography for trauma)	12 (17.1%)
Fetus	2 (2.8%)
Pelvic survey	2 (2.8%)

Table 3. Curriculum development and content of the program (basic courses and advanced courses)

Session	Objective	
Basic course		
Introduction	Introduces the development history and principles of diagnostic ultrasound, common ultrasound image artifacts and applications, as well as ultrasound machine modes and probe selection and operation methods	Lecture
Chest	Identify the timing and scope of chest ultrasonography, foundational structures of the rib cage, ultrasound features of pneumothorax, characteristics of pleural effusion on ultrasound, and ultrasound features of pulmonary edema and parenchymal consolidation.	Workshop
Abdomen	Identify the relationship of intraabdominal organs, including liver, gallbladder, kidney, Morrison's pouch, diaphragm, spleen, aorta, and vena cava	Workshop
Cardiac	Identify basic cardiac view, including apical 4-chamber, parasternal long-axis, and short-axis views, showcasing heart structures from different angles for comprehensive assessment of cardiac anatomy and function.	Workshop
Trauma	Quickly identify and evaluate potential life-threatening injuries, particularly in the abdominal and pericardial areas. Identify the timing and extended applications of trauma ultrasonography, focusing on four areas: the right upper quadrant (liver and kidney), left upper quadrant (spleen and kidney), suprapubic region (bladder), and pericardium (heart).	Workshop
Advanced course		
Introduction	Introduce the concepts and the indication of ultrasound assistance procedures, including central venous catheter placement, scanning and aspiration of body cavity fluid, and scanning and aspiration of joint effusion.	Lecture
Puncture	Introduction to basic puncture methods, needle control techniques, optimization of ultrasound imaging, and principles of sterility and safety in ultrasound-guided puncture procedures.	Workshop
Airway application	Identify neck respiratory tract structures, auxiliary applications during intubation, and emergent use of cricothyroidotomy procedures.	Workshop
Shock	Introduce the application of the RUSH exam, abdominal aorta scanning, assessment of deep vein thrombosis in the lower extremities, ultrasound features of pericardial tamponade, and ultrasound characteristics of severe pulmonary embolism.	Workshop
Urinary system	Identify the basic structures of kidney and bladder, detect and assess the severity of hydronephrosis, and calculate residual urine in the bladder.	Workshop

Figure 1. Proficiency Levels (1-10 Points) After Various Ultrasound Courses
圖表標題



Pictures. Photos from POCUS training

