急診科 Emergency

October 18, 2025 (Sat)
Room 302

主　　題：急重症超音波/照護端超音波新進展
The Advances in Emergency and Critical Care Ultrasound/ Point-of-care Ultrasound

內容簡述：急重症超音波及照護端超音波近年來發展迅速，本次年會將與各醫界先進分享目前之新進展。

時間 Time	題目 Topic	演講者 Speaker
Moderator:	連琬菁 Wan-Ching Lien 臺大醫院	
13:30-13:40	Opening	連琬菁 Wan-Ching Lien 臺大醫院
13:40-14:00 ES-S01	How to Enhance the Nvices' Learning in Ultrasound-guided Procedures Utilizing Handmade Phantoms?	黃堅泰 Chien-Tai Huang 臺大新竹分院
14:00-14:20 ES-S02	Prospective Clinical Evaluation of Deep Learning for Ultrasonographic Screening of Abdominal Aortic Aneurysms	鄭吉詠 Chi-Yung Cheng 高雄長庚醫院
14:20-14:40 ES-S03	Augmented Reality Visualization for Ultrasound-guided Interventions: A Pilot Randomized Crossover Trial to Assess Trainee Performance and Cognitive Load	呂建勳 Jian-Xun Lu 林口長庚醫院
14:40-15:00 ES-S04 (Video)	Application of Machine Learning to Ultrasonography in Identifying Anatomical Landmarks for Cricothyroidotomy Among Female Adults: A Multi-center Prospective Observational Study	王志宏 Chih-Hung Wang 臺大醫院
15:00-15:20 ES-S05	Ten Questions on Using Lung Ultrasonography to Diagnose and Manage Pneumonia in the Hospital-at-Home Model: Part I-Techniques and Patterns	許甯傑 Nin-Chieh Hsu 臺大醫院胸腔科
15:20-15:30 ES-S06	Woman with Lower Abdominal Pain	江承漢 Cheng-Han Chiang 大林慈濟醫院
15:30-15:50	Coffee Break	
15:50-16:10 ES-S07	Prehospital Ultrasound Scanning for Abdominal Free Fluid Detection in Trauma Patients: A Systematic Review and Meta-Analysis	林坤德 Kun-Te Lin 彰化基督教醫院
16:10-16:30 ES-S08	Diagnostic Accuracy of Transthoracic Echocardiography for Acute Type A Aortic Syndrome: A Systematic Review and Meta-Analysis	葉忻慈 Hsin-Tzu Yeh 林口長庚醫院
16:30-16:40 ES-S09	A Man with Blurred Vision: Application of POCUS in Emergency Department	李維鈞 Wei-Jing Lee 奇美醫院
16:40-16:50 ES-S10	Man with a Painful Inguinal Mass	江承漢 Cheng-Han Chiang 大林慈濟醫院
16:50-17:00 ES-S11	Detecting Advanced Esophageal Cancer by Point of Care Ultrasonography	陳家慶 Chia-Ching Chen 彰濱秀傳醫院

ePoster

ES-P01	Usage of Point-of-Care Ultrasonography for Diagnosing Portal Vein Thrombosis	陳家慶 Chia Ching Chen 彰濱秀傳醫院急診科
ES-P02	Usage of Point-of-Care Ultrasonography for Diagnosing Pneumomediastinum	廖娸君 Chi Chun Liao 彰化秀傳紀念醫院

ES-S01

How to Enhance the Novices' Learning in Ultrasound-guided Procedures Utilizing Handmade Phantoms?

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This prospective study evaluated ultrasound-guided thoracocentesis and pericardiocentesis training for novices using handmade phantoms. Thirty-six novices (18 undergraduate-year students and 18 PGY-1 residents) were trained and assessed, with reassessment at three months using high-fidelity phantoms, while 12 PGY-3 emergency medicine residents served as comparators. Novices showed significant skill retention in thoracocentesis at three months compared with immediate assessment [5 (4–5) vs. 3.5 (3–4), p = 0.0005], achieving proficiency comparable to PGY-3 residents [5 (4–5) vs. 5 (5), p = 0.105]. In contrast, pericardiocentesis proficiency declined without clinical exposure [3 (3–4) vs. 4 (4–4.5), p = 0.015]. Puncture time was similar between groups, though novices required more attempts in pericardio-centesis. These results suggest that while novices can effectively retain thoracocentesis skills, pericardiocentesis training is prone to decay, likely due to its rarity and higher procedural complexity. Further studies should examine retraining intervals, long-term skill transfer to clinical practice, and the potential role of standardized educational videos.

ES-S02

ES-S03

Augmented Reality Visualization for Ultrasound-guided Interventions: A Pilot Randomized Crossover Trial to Assess Trainee Performance and Cognitive Load

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Background:

Augmented reality (AR) technology involving head-mounted displays (HMD) represents a significant innovation in medical education, particularly for training in guided invasive procedures. Novice physicians often face challenges in simultaneously identifying anatomical landmarks and performing procedures when learning point-of-care ultrasound (POCUS). Our primary objective was to determine the effectiveness of AR in enhancing physician

training for ultrasound-guided interventions using AR visual overlays. The secondary objective was to compare cognitive load between traditional ultrasound training settings and AR-assisted training settings.

Methods:

This randomized crossover study, conducted from 2021 to 2022, compared performance and cognitive load of trainees attempting accurate central venous catheter (CVC) placement using an AR-HMD to display ultrasound

images (AR-US), compared with standard ultrasound without visual overlay (S-US). We enrolled 47 trainees, including 22 final-year undergraduate medical students and 25 postgraduate physicians (years 1–4) from three hospitals in Taiwan. All participants had basic training in US-guided CVC placement but lacked AR-US experience. Performance and cognitive load were assessed using time measurements and NASA Task Load Index (NASA-TLX), covering the dimensions of Mental-, Physical- and Temporal Demand, and Performance, Effort and Frustration.

Result:

We found AR technology reduced the time required for critical steps in CVC placement, while minimizing users' neck strain. Female and junior trainees using AR-US identified anatomy and localized veins faster than those using S-US. Using AR-US, female trainees significantly outperformed males in anatomical identification [mean difference (MD): -10.79 s (95% CI: -2.37 to -19.21)]. The NASA-TLX cognitive load assessment showed mental workload

trending lower in all dimensions except performance while using AR-US, compared to S-US. Similarly, junior trainees' effort- and frustration scores were lower [MD: -2.73 (95% CI: -5.04 to -0.41) and -2.41 (95% CI: -4.51 to -0.31), respectively], as were female trainees' effort scores [MD: -3.07 (95% CI: -6.10 to -0.03)] when using AR-US, compared to S-US, whereby these differences were statistically significant.

Conclusions:

AR technology helped improve trainee performance and reduced cognitive load during ultrasound-guided CVC placement. These findings support the application of AR technology to enhance physician training ultrasound-guided interventional procedures, suggesting that AR-HMDs could be a valuable tool in medical education.

Keywords:

Augmented reality, Ultrasound-guided central venous catheter (CVC), Point-of-care ultrasound (POCUS), Cognitive load, NASA Task Load Index, Medical education

ES-S04

Application of Machine Learning to Ultrasonography in Identifying Anatomical Landmarks for Cricothyroidotomy Among Female Adults: A Multi-center Prospective Observational Study

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We aimed to develop machine learning (ML)-based algorithms to assist physicians in ultrasound-guided localization of cricoid cartilage (CC) and thyroid cartilage (TC) in cricothyroidotomy. Adult female volunteers were prospectively recruited from two hospitals between September and December, 2020. Ultrasonographic images were collected via a modified longitudinal technique. You Only Look Once (YOLOv5s), Faster Regions with Convolutional Neural Network features (Faster R-CNN), and Single Shot Detector (SSD) were selected as the model architectures. A total of 488 women (mean age: 36.0 years) participated in the study, contributing to a total of 292,053 frames of ultrasonographic images. The derived ML-based algorithms demonstrated excellent discriminative performance for the presence of CC (area under the receiver operating characteristic curve [AUC]: YOLOv5s, 0.989, 95% confidence interval [CI]: 0.982-0.994; Faster R-CNN, 0.986, 95% CI: 0.980-0.991; SSD, 0.968, 95% CI: 0.956-0.977) and TC (AUC: YOLOv5s, 0.989, 95% CI: 0.977-0.997; Faster R-CNN, 0.981, 95% CI: 0.965-0.991; SSD, 0.982, 95% CI: 0.973-0.990). Furthermore, in the frames where the model could correctly indicate the presence of CC or TC, it also accurately localized CC (intersection-over-union: YOLOv5s, 0.753, 95% CI: 0.739-0.765; Faster R-CNN, 0.720, 95% CI: 0.709-0.732; SSD, 0.739, 95% CI: 0.726-0.751) or TC (intersection-over-union: YOLOv5s, 0.739, 95% CI: 0.722-0.755; Faster R-CNN, 0.709, 95% CI: 0.687-0.730; SSD, 0.713, 95% CI: 0.695-0.730). The ML-based algorithms could identify anatomical landmarks for

cricothyroidotomy in adult females with favorable discriminative and localization performance. Further studies are warranted to transfer this algorithm to hand-held portable ultrasound devices for clinical use.

ES-S05

Ten Questions on Using Lung Ultrasonography to Diagnose and Manage Pneumonia in the Hospital-at-Home Model: Part I-Techniques and Patterns

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The hospital-at-home (HaH) model delivers hospital-level acute care, including diagnostics, monitoring, and treatments, in a patient's home. It is particularly effective for managing conditions such as pneumonia. Point-of-care ultrasonography (PoCUS) is a key diagnostic tool in the HaH model, and it often serves as a substitute for imaging-based diagnosis in the HaH setting. Both standard and handheld ultrasound equipment are suitable for lung ultrasound (LUS) evaluation. Curvelinear and linear probes are typically used. Patient positioning depends on their clinical condition and specific diagnostic protocols. To enhance sensitivity, we recommend using at least 10-point protocols supported by studies for pneumonia. Five essential LUS patterns should be identified, including A-line, multiple B-lines (alveolar-interstitial syndrome), confluent B-lines, subpleural consolidation, and consolidation with air bronchogram. Pleural effusion is common, and its internal echogenicity can indicate severity and the need for invasive procedures. The current evidence on various etiologies and types of pneumonia is limited, but LUS demonstrates good sensitivity in detecting abnormal sonographic patterns in atypical pneumonia, tuberculosis, and ventilator-associated pneumonia. Further LUS studies in the HaH setting are required to validate and generalize the findings.

ES-S06

Woman with Lower Abdominal Pain

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A 51-year-old woman with known myomas (fibroids) presented to the emergency department with 2 days of fever, lower abdominal pain, and general weakness 3 days after she received the first dose of leuprolide—a gonadotropin releasing hormone (GnRH) agonist. On physical examination, the patient was alert but febrile (temperature, 38.6 °C), her pulse rate was 117 beats/min, and her blood pressure was 109/73 mmHg. On palpation, there was a huge elastic tender mass over lower abdomen (Figure 1). Her WBC count was 21,610/mm3, hemoglobin was 8.9 g/dL, and C-reactive protein was 27 mg/dL. Abdominal ultrasonography (Figure 2) and contrast-enhanced computed tomography (Figure 3) were performed.

Degenerative myoma (fibroid) with infarction and hemorrhage. The patient received oxytocin, tranexamic acid, antibiotics, and blood transfusion. Degenerative myoma with infarction was confirmed intraoperatively and pathologically (Figure 4). The patient was discharged uneventfully on the fifth day after surgery.

Uterine myoma, common in women, is effectively treated with GnRH agonists, especially for women in the menopausal transition who experience symptomatic myomas.[1,2] However, acute abdominal pain, fever, leukocytosis, and physiologic ascites (due to GnRH agonist–induced ovarian hyperstimulation) may occur and mimic surgical emergencies like uterine rupture.[3-5]

ES-S07

Prehospital Ultrasound Scanning for Abdominal Free Fluid Detection in Trauma Patients: A Systematic Review and Meta-analysis

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Introduction:

Focused assessment with sonography for trauma helps detect abdominal free fluid. Prehospital ultrasound scanning is also important because the early diagnosis of hemoperitoneum may reduce the time to definitive treatment in the hospital. This study investigated whether prehospital ultrasound scanning can help detect abdominal free fluid.

Materials and methods:

In this systematic review, relevant databases were searched for studies investigating prehospital ultrasound examinations for abdominal free fluid in trauma patients. The prehospital ultrasound results were compared with computed tomography, surgery, or hospital ultrasound examination data. The pooled sensitivity and specificity values were analyzed using forest plots. The overall predictive power was calculated by the summary receiver operating characteristic curve. The quality of the included studies was assessed using the quality assessment of diagnostic accuracy studies tool. The Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) was performed to assess the certainty of evidence.

Result:

This meta-analysis comprised six studies that included 1356 patients. The pooled sensitivity and specificity values were 0.596 (95% confidence interval [CI] = 0.345-0.822) and 0.970 (95% CI = 0.953-0.983), respectively. The pooled area under the summary receiver operating characteristic curve was 0.998. The quality assessment tool showed favorable results. In the GRADE analysis, the quality of evidence was very low for sensitivity and high for specificity when prehospital ultrasound was used for hemoperitoneum diagnosis.

Conclusion:

The specificity of abdominal free fluid detection using prehospital ultrasound examinations in trauma patients was very high.

Key words:

Prehospital, Ultrasound, FAST, Trauma

ES-S08

Diagnostic Accuracy of Transthoracic Echocardiography for Acute Type A Aortic Syndrome: A Systematic Review and Meta-analysis

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Transthoracic echocardiography (TTE) has emerged as a potential first-line imaging modality for patients with suspected acute type A aortic syndrome (AAAS). Direct TTE signs, such as an intimal flap or ascending aortic wall thickening, indicate the presence of AAAS, whereas indirect signs, including aortic root dilatation, pericardial effusion, and aortic regurgitation, reflect high-risk features. We systematically reviewed prospective and retrospective diagnostic cohort studies from PubMed, EMBASE, MEDLINE, and the Cochrane Library that assessed TTE for AAAS. Pooled sensitivity, specificity, positive and negative likelihood ratios, diagnostic odds ratios, and hierarchical summary receiver-operating characteristic curves were calculated, with study quality evaluated using QUADAS-2 and GRADE criteria. Ten studies involving 2,886 patients were included. Direct TTE signs demonstrated a pooled sensitivity of 58% (95% CI, 38–76%) and

specificity of 94% (95% CI, 89–97%), while any TTE signs showed higher sensitivity at 91% (95% CI, 85–94%) but lower specificity of 74% (95% CI, 61–84%). HSROC analysis in four studies indicated superior diagnostic accuracy for direct signs compared with any signs, with areas under the curve of 0.95 (95% CI, 0.92–0.96) versus 0.87 (95% CI, 0.84–0.90). These findings suggest that TTE can serve as an effective initial imaging test for patients with suspected AAAS, where the presence of direct signs strongly supports the diagnosis, and the absence of any TTE abnormalities, particularly in patients with low clinical suspicion, may indicate a lower likelihood of disease, supporting its integration into early diagnostic pathways.

ES-S09

A Man with Blurred Vision: Application of POCUS in Emergency Department

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Patients with ocular complaints can be common in the Emergency Department. Ophthalmologist consultation may not be readily available in all settings and direct fundoscopic examinations can be difficult to perform with confidence by the emergency physicians. Accordingly, bedside Point-of-care ocular/eye ultrasound by the emergency physicians provide a quick and non-invasive method to differentiate potential ophthalmologic emergencies. We presented a man with blurred vision and severe headache caused by lens dislocated in the posterior chamber in addition to vitreous opacity.

Point-of-care ocular/eye ultrasound maybe used for patients with traumatic visual disturbance or painless visual disturbance. If eyeball rupture is suspected, consult Ophthalmologist as soon as possible and POCUS may still be performed carefully by applying copious amount of gel and implemented no pressure to the eye.

ES-S10

Man with a Painful Inguinal Mass

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A 63-year-old man presented to the emergency department with a 2-hour history of a painful protruding mass in his right groin. While this had been manually reducible for years, after an extended period of heavy manual labor, this became irreducible. On examination, he was alert and febrile with a blood pressure of 170/106 mmHg and a pulse rate of 82 beats/min. Palpation revealed a tender ovoid soft mass in his right groin. Plain film (Figure 1) and point-of-care ultrasound (Figure 2, left panel; Video E1, available at http://www.annemergmed.com/) were performed, and the diagnosis was confirmed by computed tomography (Figure 2, right panel).

Incarcerated inguinal bladder herniation caused by a herniated urinary bladder calculus. Inguinal bladder hernia is a rare condition, but merits consideration in older male patients, especially with those with benign prostatic hyperplasia, lower urinary tract symptoms, or a history of previous inguinal surgery.[1,2] Inguinal bladder hernia can be predisposed by increased intra-abdominal pressure and has the potential to become incarcerated, especially if accompanied by urinary bladder stones.[3] Due to unsuccessful manual reduction in the emergency department, the patient underwent herniorrhaphy. He was discharged uneventfully the following day and received cystolithotripsy 1 month later.

ES-S11

Detecting Advanced Esophageal Cancer by Point-of-care Ultrasonography

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Esophageal cancer (EC) is the 8th-most common cancer and the 6th-most common cause of death worldwide in 2020. Patients with EC might present with a variety of symptoms, such as chest tightness, retrosternal pain, acid regurgitation, heartburn sensation, dyspnea, cough, recurrent pneumonia, hoarseness, dysphagia, and weight loss, which make early diagnosing EC extremely difficult. Currently, the golden diagnostic tool of EC remains endoscopic biopsy. However, in patient suspected advanced EC, point-of-care ultrasonography (POCUS) could be a first-line screening tool. By three zones of esophageal sonography including esophageal inlet, middle third segment of esophagus just beneath the cardiac chambers, and esophagogastric junction, we could be able to detect sonographic evidence of advanced EC including heterogeneous hyperechoic esophageal mass, loss of normal wall differentiation, and mass effect to adjacent structure such as left atrium. For patients with chest pain, POCUS should be focused on cardiac, adjust mediastinum and lung survey. Here, we present a 73-year-old male presented to the emergency department with retrosternal chest pain for 3 months. POCUS revealed esophageal mass which is also proved by computer tomography and endoscopic biopsy on the same day.

ES-P01

Usage of Point-of-Care Ultrasonography for Diagnosing Portal Vein Thrombosis

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Introduction:

Portal vein thrombosis (PVT) is a potentially serious vascular disorder that can lead to portal hypertension, intestinal ischemia, and impaired liver function. Early diagnosis is crucial, as timely intervention can prevent progression to chronic thrombosis and reduce complications such as variceal bleeding or ascites. In patients with underlying liver disease, particularly cirrhosis or hepatocellular carcinoma, prompt detection of PVT influences treatment planning, transplant eligibility, and prognosis. Non-invasive imaging, especially Doppler ultrasound, enables rapid assessment of portal vein patency, facilitating early management decisions. Recognizing PVT at its initial stage offers the best chance for preserving hepatic function and improving patient outcomes. Here we present a case report of PVT in which point-of-care ultrasonography (POCUS) provides direct evidence of thrombosis.

Case:

A 75-year-old female with cirrhosis presented to the emergency department (ED) with a 12-hour history of progressive epigastric abdominal dull pain. Fever and nausea were accompanied. Her abdomen was soft, distended, with dullness on percussion, without rebound tenderness. Point-of-care ultrasound (POCUS) revealed distension of the portal vein (Fig. 1) with an absence of flow signal (Fig. 2). Abdominal computed tomography confirmed the diagnosis of pneumoperitoneum (Fig. 3). She was admitted for anticoagulation therapy and discharged without complications, remaining stable during follow-up.

Discussion:

Point-of-care ultrasound (POCUS) offers a rapid, bedside method for detecting portal vein thrombosis (PVT), particularly in high-risk patients such as those with cirrhosis, hepatocellular carcinoma, or acute abdominal pain. Doppler capabilities allow real-time assessment of portal vein patency, flow direction, and velocity, enabling early identification of thrombus before complications arise. Compared to CT or MRI, POCUS is more accessible, repeatable, and free of radiation or contrast risks, making it ideal for acute settings. Early PVT detection with POCUS can guide timely anticoagulation or interventional planning, improve outcomes, and integrate seamlessly into routine surveillance for patients with chronic liver disease.

ES-P02

Usage of Point-of-Care Ultrasonography for Diagnosing Pneumomediastinum

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Introduction:

Pneumomediastinum, the presence of air within the mediastinal space, can arise from trauma, barotrauma, infection, or spontaneous causes. Early diagnosis is vital, as it may signal underlying life-threatening conditions such as tracheobronchial rupture, esophageal perforation, or tension pneumomediastinum. Prompt recognition enables timely intervention to prevent complications, including airway compromise, cardiovascular collapse, or mediastinitis. In critically ill or high-risk patients, rapid bedside imaging, such as point-of-care ultrasound or chest radiography, can expedite detection and guide further evaluation. Identifying pneumomediastinum in its early stages improves patient outcomes by facilitating targeted management and reducing the risk of progression to severe cardiopulmonary compromise. Here we present a case report of pneumomediastinum in which point-of-care ultrasonography (POCUS) provides direct evidence of free air.

Case:

A 30-year-old male presented to the emergency department (ED) with an 8-hour history of progressive chest tightness. Sore throat and neck pain were accompanied. His chest was symmetric on respiration, with palpable neck crepitus on palpation. Point-of-care ultrasound (POCUS) revealed echogenic foci with posterior “dirty shadowing” along fascial planes (Fig. 1). Chest computed tomography confirmed the diagnosis of pneumo-mediastinum (Fig. 2). He was admitted for conservative treatment and discharged without complications, remaining stable during follow-up.

Discussion:

Point-of-care ultrasound (POCUS) is an emerging tool for the rapid bedside detection of pneumomediastinum, offering a radiation-free alternative to conventional imaging. Sonographic signs include the “air gap” or “reverberation” artifacts over the neck, cardiac silhouette, and loss of normal pleural or pericardial interfaces. POCUS can detect even small volumes of mediastinal air that may be missed on an initial chest radiograph, particularly in supine patients. Its portability and immediacy make it valuable in emergency and critical care settings, enabling early diagnosis, prompt evaluation for underlying causes, and timely initiation of treatment. Integrating POCUS into assessment protocols can significantly enhance diagnostic efficiency.