

Review Article

# Time to FOCUS - 'Palliative Medicine Point-of-Care Ultrasound'

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## ABSTRACT

Point-of-care diagnosis has become the need of the hour and along with its guided interventions, ultrasound could be utilised bedside in a palliative care patient. Point-of-care ultrasound (POCUS) in palliative care medicine is fast emerging and has varied applications ranging from performing bedside diagnostic evaluation to the performance of interventional paracentesis, thoracentesis and chronic pain interventions. Handheld ultrasound devices have transformed the application of POCUS and should revolutionise the future of home-based palliative care. Palliative care physicians should be enabled to carry out bedside ultrasounds at home care and hospice setting for achieving rapid symptom relief. The aim of POCUS in palliative care medicine should be adequate training of palliative care physicians, transforming the applicability of this technology to OPD as well as community driven to achieve home outreach. The goal is towards empowering technology by reaching out to the community rather than the terminally ill patient transported for the hospital admission. Palliative care physicians should receive mandatory training in POCUS to enable diagnostic proficiency and early triaging. The inclusion of ultrasound machine in an outpatient palliative care clinic brings about value addition in rapid diagnosis. Limiting POCUS application to certain selected sub-specialties such as emergency medicine, internal medicine and critical care medicine should be overcome. This would need acquiring higher training as well as improvised skill sets to perform bedside interventions. Ultrasonography competency among palliative care providers proposed as palliative medicine point-of-care ultrasound (PM-POCUS) could be achieved by imparting dedicated POCUS training within the core curriculum.

**Keywords:** Point-of-care ultrasound, Palliative medicine point-of-care ultrasound, Palliative care medicine

## INTRODUCTION

Ultrasound skillset in palliative care stems from the extension of internal medicine, emergency medicine, family medicine and intensive care principles into palliative medicine.<sup>[1-6]</sup> Point-of-care diagnosis has become the need of the hour and along with its guided interventions; ultrasound could be used bedside in a palliative care patient.

Point-of-care ultrasound (POCUS) has been defined as performance of ultrasound imaging by the treating clinician at patient's bedside and it differs from routine ultrasound imaging which is usually performed by a radiologist in a hospital setup. POCUS is an inclusive terminology, not strictly restricted to any sub-speciality like critical care medicine or emergency medicine domains.<sup>[7-9]</sup>

POCUS has found its application in hospital, hospice and home care settings.<sup>[10,11]</sup> POCUS for palliative care medicine is fast emerging as an important diagnostic and interventional modality.<sup>[12-14]</sup> It is utilised to acquire, interpret, diagnose and intervene in the palliative care medicine setting by

the attending clinician. POCUS strives for a reduction in patients visiting the hospital and providing utmost clinical utility at the patient bedside, thereby improving the quality of life among palliative care patients. The aim of POCUS in palliative care is towards empowering technology reaching out to the community rather than the terminally ill patient reaching out to seek hospital admission.<sup>[1,15]</sup>

Mobile care units that could transform home care in palliative care medicine practice need to be equipped with POCUS machines. These mobile care units could be deployed for home visits or be utilised in a hospice setting; wherein acute medical management of palliative care patients could be performed. Similarly, the inclusion of ultrasound machine in an outpatient palliative care clinic brings about value addition in rapid diagnosis and may alter treatment trajectories by expediting symptom relief and thereby reducing length of stay in the hospital.<sup>[1,15-19]</sup>

Ultrasound devices have become compact, portable and easily accessible towards empowering palliative care.

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Received: 16 November 2022 Accepted: 13 December 2022 Epub Ahead of Print: 12 January 2023 Published: 20 January 2023 DOI: 10.25259/IJPC\_274\_2022

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Handheld devices have revolutionised the application of POCUS, which provides a dynamic assessment of a patient's clinical condition, performed each time at the bedside. This could lead to triaging a given patient, as to whether the patient needs admission priority into an emergency medicine unit. Handheld ultrasound devices have transformed the application of POCUS in the home-based palliative care setting.<sup>[1,20,21]</sup>

Palliative care physicians should receive mandatory training in POCUS to enable diagnostic proficiency. This would need acquiring higher training, as well as improvised skill sets, along with overcoming the associated implementation barriers to effective clinical practice. It is therefore imperative that palliative care physicians be well trained in acquiring an ultrasound skill set which has often been limited to an emergency physician in acute medical care and perioperative setting.<sup>[22-24]</sup> Ultrasonography competency among palliative care providers could be achieved by imparting dedicated POCUS training within the core curriculum.<sup>[1,2,9,22,23]</sup>

This review aims to explore the application, importance and feasibility of POCUS in various diagnostic and therapeutic interventions of palliative care medicine.

A database search was performed using the terms 'Palliative medicine' and POCUS and 'point-of-care ultrasound'. MESH terms included palliative medicine, palliative care, POCUS, point of care, point-of-care systems, point-of-care diagnostic imaging, ultrasound, ultrasonic, POCUS and ultrasonography.

Database search yielded PubMed (7), PubMed Central (71), Cochrane (0) and EMBASE (746) after applying filters for including open-access journals and currently published in the field of medicine.

### THE SCOPE FOR POCUS IN PALLIATIVE CARE

POCUS has widened its horizon across various clinical presentation spectrums involving cardiovascular diseases, metastatic cancer, chronic respiratory diseases, progressive neurological disease and acquired immunodeficiency syndrome, especially associated with disease progression and leading to terminal incapacitating illness needing dedicated palliative care medical services.<sup>[1,9,25]</sup>

Dynamic changes which accompany acute decompensation of disease failed initial management plan, disease advancement and rapid progression may need clinical decisions to be taken on a prioritised urgency basis. This could alter the management pathway in a patient having an already limited functional reserve. The scenarios may vary across limited resource settings such as home-based care, old age home, institutional long-term stay centres, hospice, daycare units and outpatient service areas or may occur at a resourceful hospital setting including high dependency units and intensive care units involving dedicated palliative care facilities.<sup>[25]</sup>

### VALUE ADDITION BY POCUS

The single goal of POCUS would be to improve diagnostic and interventional decision-making, which could bring about a change in the quality of life of a palliative care patient. This could be achieved by aiming to attain symptom relief and patient comfort at the bedside. A right balance must be attained by balancing the risk versus benefit, while at the same time avoiding the futility of care. The time to establish a diagnosis becomes imperative in an acute palliative care setting. At the same time, maintaining accuracy in diagnosis would be equally paramount which could be achieved by dedicated training in POCUS.<sup>[25]</sup>

POCUS probably has the most cost efficiency, wherein home- or hospice-based diagnostic procedures could be streamlined and targeted specific interventions could be carried out. This would benefit in optimising the length of stay in hospice, as well as expediting the transition to home care. End-stage chronic disease patients in the advanced malignancy subset may not afford repeated emergency and critical care admissions. These patient subsets would probably benefit the most from timely care at home care, hospice, daycare and outpatient hospital care. This would bring in guided specific targeted interventions and focused diagnostic exclusions by POCUS.<sup>[1]</sup>

### ADVENT OF HANDHELD ULTRASOUND DEVICES

The advent of handheld ultrasound devices has revolutionised POCUS in making bedside clinical decisions. In a recent study, POCUS could suspect a diagnosis with confirmation in about 50% of cases, leading to a diagnostic change from the initial suspicion in about 23% of cases.<sup>[25,26]</sup>

Telemedicine relay is possible in a few of these systems which utilise digital imaging and communication in medicine format. Deep learning algorithms are available for precise imaging guidance, estimating closed cavity fluid volume, grading flow gradient and aiding clinical decision-making. Efforts are ongoing for the inclusion of artificial intelligence in decision-making algorithms to help in early patient triage.<sup>[15,26]</sup>

### POCUS APPLICATIONS

The most important diagnostic applications of POCUS in palliative care medicine [Table 1] include bedside sonography for differential diagnosis of pain in the abdomen, breathlessness, musculoskeletal pain, deep vein thrombosis and venous thromboembolism.<sup>[1]</sup>

The guided interventional procedures include pleurocentesis, peritoneal paracentesis, musculoskeletal interventions and nerve blocks for pain management. Hospital-based guided interventions towards attaining central venous access, peripheral venous access, midline catheter, chemo port placement, peripherally inserted central venous catheter,

**Table 1:** POCUS applications in palliative care medicine.

Region-specific POCUS	Diagnostic applications	Interventional applications
Abdominal POCUS	Ascites Residual bladder volume Urinary retention differential Bowel obstruction differential Hydronephrosis Abdominal pain differential	Abdominal paracentesis Truncal and sympathetic blocks Transurethral catheter position Percutaneous nephrostomy
Thoracic POCUS	Pleural effusion Pneumothorax Pericardial effusion Pulmonary oedema Dyspnoea differential Pneumonia	Thoracocentesis Fascial plane blocks Pericardiocentesis
Limb POCUS	Deep venous thrombosis Fracture segment displacement Lower limb oedema differential	Venous access Selective peripheral nerve blocks Musculoskeletal pain interventions Synovial joint aspiration Intra-articular steroids
Optic nerve ultrasound	Raised intracranial pressure	
Chronic pain ultrasound applications	Regional pain differential	Chronic pain interventions

POCUS: Point-of-care ultrasound

regional anaesthesia interventions in the form of fascial plane blocks, selective nerve blocks and plexus blocks could be performed efficiently utilising POCUS.<sup>[1]</sup>

### POCUS DIFFERENTIAL DIAGNOSIS FOR DYSPNOEA

The associated anxiety and fear with dyspnoea if relieved bedside at home, thereby preventing imminent hospital transfers to an emergency medical unit, probably would achieve the testimony to POCUS in a palliative care setting. The differential in establishing the cause for acute dyspnoea could be multifactorial ranging from life-threatening conditions such as malignant pleural effusion [Figure 1], pneumothorax, exacerbation of pre-existing chronic obstructive pulmonary disease and decompensated heart failure.<sup>[27-29]</sup>

The most dreaded symptom of dyspnoea could be differentiated by its cardiorespiratory components and in its causation of decompensation. Exacerbation of dyspnoea could be due to pre-existing chronic lung disease; as against a new development of decompensated heart failure manifesting as global hypokinesia. Sub-xiphoid view provides a useful window for focused cardiac ultrasound to rule out pericardial effusion [Figure 2] and tamponade.<sup>[1]</sup>

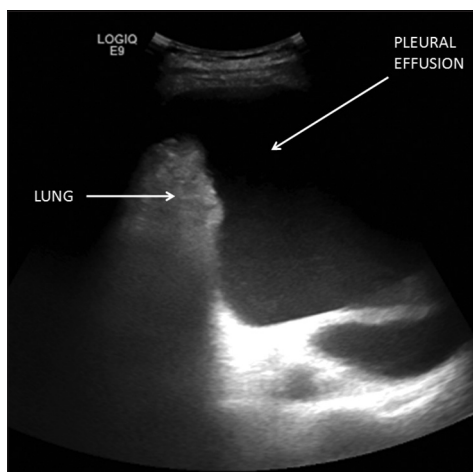
A differential of pulmonary embolism, atelectasis and pneumonia may need to be ruled out by the attending palliative physician during a home visit. Achieving good symptom control bedside would become the most important goal in this setting. At the same time, careful consideration must be exercised in avoiding the futility of care. Judicious

management towards exercising clinically significant benefit against the creation of resultant harm in an individual patient must be considered at every stage.<sup>[25]</sup>

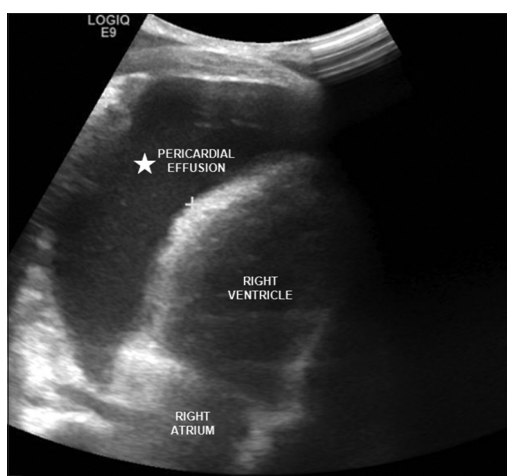
A newly diagnosed pneumothorax, pulmonary embolism, pulmonary oedema, and pericardial effusion, leading to tamponade would warrant an urgent bedside diagnosis.<sup>[28]</sup> Whereas, lung conditions such as pneumonitis and pneumonia may need additional imaging after an initial POCUS. Atelectasis and neoplastic chest infiltration may be demonstrable on initial POCUS. Interstitial alveolar syndrome and hemi-diaphragmatic paresis could be evaluated bedside with superior diagnostic sensitivity and specificity.<sup>[29]</sup> A simultaneous gastric ultrasound would rule out aspiration as a cause of sudden onset dyspnoea.<sup>[25,30]</sup>

Ultrasound guidance for pleural thoracocentesis has added safety, wherein an appropriate site for inserting an intercostal drain or pigtail catheter could be decided. Pleural effusion accounts for a 15% prevalence among palliative care patients with malignancy.<sup>[31]</sup> Peritoneal paracentesis and pleural thoracocentesis could be performed at home, hospice, outpatient, daycare setting, or institutional inpatient setting using POCUS.<sup>[32]</sup>

Having a dedicated protocol for palliative care assessments encompassing various clinical scenarios may add up to the course curriculum for POCUS in palliative care. For example, devising a dyspnoea protocol like the 'BLUE and FALLS' protocol in emergency and critical care evaluation could result in the treatment decisions becoming uniform across palliative care practice.<sup>[29,30]</sup>



**Figure 1:** USG image showing pleural effusion with collapsed lung.

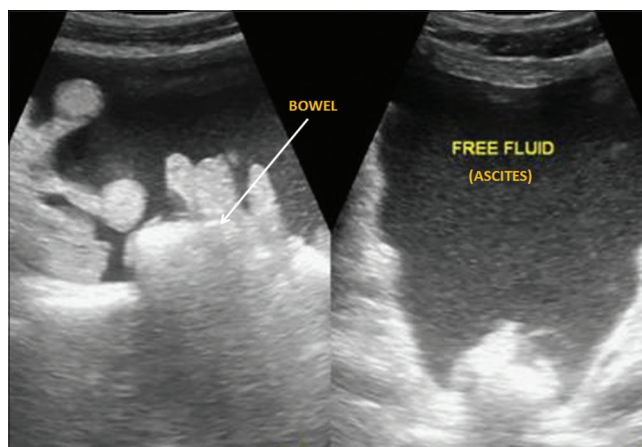


**Figure 2:** USG image showing pericardial effusion with the right atrium and right ventricle.

### POCUS DIFFERENTIAL DIAGNOSIS FOR ABDOMINAL PATHOLOGY

Acute flank pain in a palliative patient could be diagnosed by early POCUS. Renal colic, acute ureteral obstruction, urolithiasis, pyelonephritis, and myofascial pain could be differentiated early by a focused POCUS examination; before subjecting the patient to a definitive computed tomography, which is the gold standard.<sup>[33-36]</sup>

Diagnosis of ascites [Figure 3] and bedside drainage can be performed utilising POCUS. Intra-abdominal metastasis and bowel obstruction although need a definitive computed tomography, POCUS would still be considered as the baseline investigation in clinical decision-making and further management plan. The development of constipation and vomiting in a palliative patient also warrants an initial POCUS, which would help in differentiating causation for underlying symptoms. POCUS would be the first line



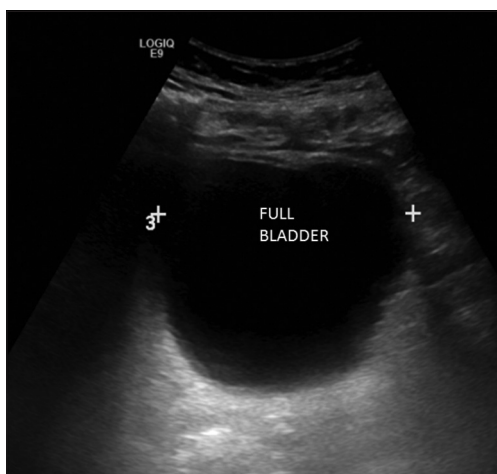
**Figure 3:** USG image showing ascitic fluid with bowel loops.

modality as it would avoid an intravenous contrast injection, especially in the clinical scenario associated with raised creatinine levels.<sup>[1]</sup>

Flank pain and lower abdominal pain suggestive of a differential for urinary tract obstruction possess the risk of infection and progressive renal failure. Residual bladder volume is the starting point for the establishment of the diagnosis of urinary obstruction. Assessing hydronephrosis by demonstrating renal pelvis dilatation adds to the diagnosis of urinary obstruction. Immediate bladder catheterisation for full bladder [Figure 4] could be performed to relieve obstruction at home or hospice; thereby preventing an emergency hospital admission. However, the need for performing percutaneous nephrostomy, suprapubic catheterisation and ureteric stenting could be considered in case of upper urinary tract obstruction, manifesting as hydronephrosis on initial POCUS examination. POCUS could be utilised as a starting point for immediate diagnosis followed by computed tomography imaging if mandated.<sup>[1]</sup> Subacute intestinal obstruction has an estimated prevalence of over 2% in patients with intra-abdominal tumours and pelvic malignancies resulting in fluid-filled loops of the small bowel.<sup>[37]</sup> Abdominal erect plain radiographs in combination with ultrasound could add diagnostic performance, especially in the differential diagnosis of mixed aetiologies. The findings on POCUS may range from dilated bowel loops, hyperperistaltic movements terminating in an obstruction, absence of peristalsis or a complete collapse of the bowel lumen.<sup>[37]</sup> POCUS could bring about 49.5% of treatment decisions and therapeutic interventions in 19.9% of palliative patients. Based on POCUS findings, 17.7% of patients were referred for hospital admission.<sup>[20]</sup>

### DIFFERENTIATING URINARY RETENTION BY POCUS

Urinary retention is a relatively frequent symptom encountered in palliative care patients. Repeated urinary outflow



**Figure 4:** USG image showing full urinary bladder.

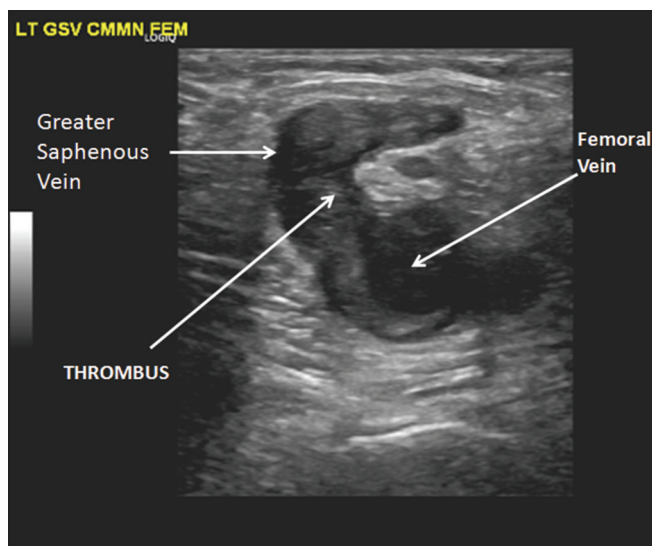
obstruction with underlying infection and associated AKI (acute kidney injury) is commonly encountered in palliative care practice. Ultrasound visualisation of the renal pelvis for hydronephrosis and residual bladder volume provides valuable inputs to the diagnosis which could necessitate ureteric stenting or percutaneous nephrostomy.<sup>[1,25,38]</sup>

In patients with an indwelling bladder catheter secondary to spinal cord injury and metastatic urothelial malignancy, visualisation of the catheter bulb by POCUS gives additional information regarding tumour or clot-related obstruction. Urinary retention due to bladder outlet obstruction could be resultant from the adverse effects of anti-cholinergic drugs, opioids and antidepressants which the patient had been prescribed.<sup>[25,38]</sup>

### DIFFERENTIATING LOWER LIMB OEDEMA UTILISING POCUS

Deep vein thrombosis could be ruled out by simple bedside compression sonography. Extended compression ultrasound could be performed by extending the ultrasound scanning sequence above the inguinal ligament down to the calf vein confluence traversing below the popliteal vessels [Figure 5]. Doppler flow studies may not be available in some of the basic ultrasound handheld devices. In the clinical scenario in which deep vein thrombosis has been suspected by the performance of either compression or extended compression ultrasound, the patient could be subjected further to Doppler flow studies and for initiating therapeutic anticoagulant medication.<sup>[25,38]</sup>

Lower limb compression ultrasound is the starting point for diagnosing pulmonary embolism and culminates with lung ultrasound and right heart strain demonstration on echocardiography as a surrogate sign. Lower limb compression ultrasound is the bedside technique of choice in a hospice setting performed at the common femoral, popliteal vein and calf vessel confluence levels. Non-compressibility



**Figure 5:** USG image showing thrombus in great saphenous vein and femoral vein.

of the venous lumen is the simplest demonstration of deep venous thrombosis suspicion. Finding an organised hyperechoic thrombus within the venous lumen may be a definitive endpoint for the establishment of diagnosis of deep venous thrombosis.<sup>[39]</sup>

### OTHER DIAGNOSTIC UTILITIES OF POCUS

Measuring optic nerve sheath diameter provides insight into raised intracranial pressure. This could be an important bedside assessment in patients with changing sensorium levels.<sup>[40]</sup>

The most common scenario of elderly patients encountering falls at home could be quickly evaluated with POCUS, which, for instance, could demonstrate a displaced fracture segment, before the patient is being subjected for a definitive X-ray in a hospital setting.<sup>[41-43]</sup>

### FOCUSED ASSESSMENT WITH SONOGRAPHY IN CANCER (FASC PROTOCOL)

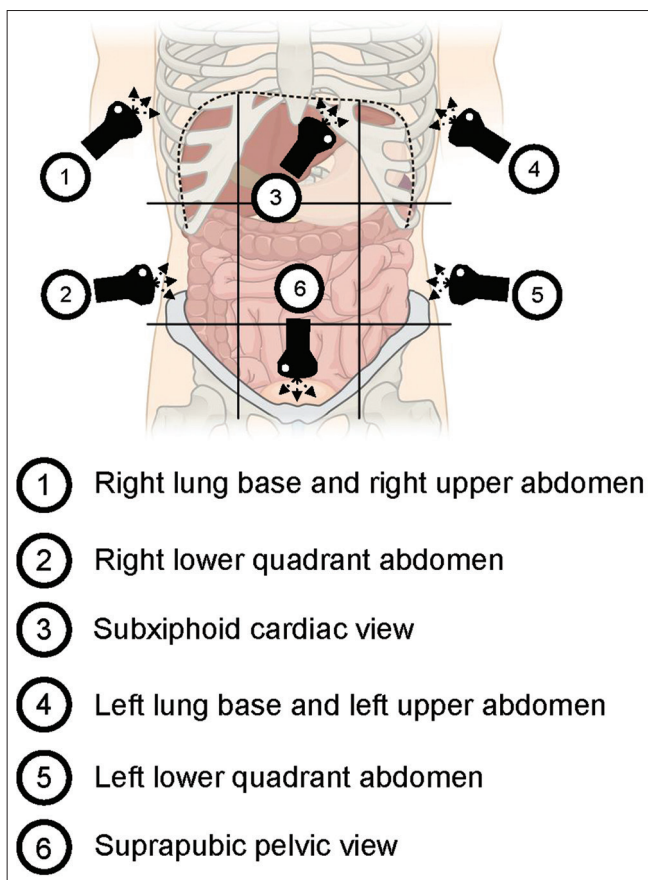
There are many protocols as listed [Table 2]<sup>[21,28,44-54]</sup> for POCUS in various specialities. FASC protocol utilises six predefined probe placement positions [Figure 6] (**Courtesy:** Dr. Benjamin Galen, MD, Editor-In-Chief, POCUS JOURNAL) to localise fluid collection in closed anatomical spaces to rapidly identify ascites, pleural and pericardial effusion. Fluid collection in the pelvis could also be identified for further diagnostic differentiation by the treating primary physician or oncologist.<sup>[44]</sup>

The sensitivity of detecting pericardial effusion, ascites and specificity of detecting pleural effusion was 96% among non-cardiologists. The specificity of identifying pericardial effusion among them was as high as 98% and the sensitivity of identification of pleural effusion was 93% when compared

**Table 2:** POCUS protocols in clinical application.

Protocols	Application subset
FAST <sup>46</sup> and eFAST <sup>21</sup>	Focused assessment with sonography in trauma
FEEL <sup>47</sup>	Focused echocardiographic evaluation in life support (emergency life support)
FATE <sup>48</sup>	Focus assessed transthoracic echocardiography
BLUE and FALLS <sup>28</sup>	Critical care, emergency medicine lung ultrasound
RUSH <sup>49</sup>	Rapid ultrasound in shock and hypotension
FoCUS <sup>50</sup>	Focused cardiac ultrasound
CAUSE <sup>51</sup>	Cardiac arrest ultrasound examination
SESAME <sup>52</sup>	Starting lung ultrasound to rule out cardiac arrest
POCUS-CA <sup>53</sup>	Point of care ultrasound cardiorespiratory arrest
RADIUS <sup>54</sup>	Rapid assessment of dyspnoea with ultrasound
VExUS <sup>55</sup>	Venous excess ultrasound score (congestion)
FASC <sup>45</sup>	Focused assessment sonography in cancer
PM-POCUS*	Palliative medicine point-of-care ultrasound

\*New terminology proposed for ultrasound use in palliative medicine point-of-care ultrasound (PM-POCUS)



**Figure 6:** Schematic image showing protocol for focused assessment with sonography in cancer examination. Courtesy Dr Benjamin Galen, MD, Editor-In-Chief, POCUS JOURNAL.

with computed tomography imaging.<sup>[44]</sup> We propose an 8-point protocol for probe placement positions [Figure 7] for palliative medicine POCUS.

## POCUS GUIDED INTERVENTIONS IN PALLIATIVE CARE PATIENTS

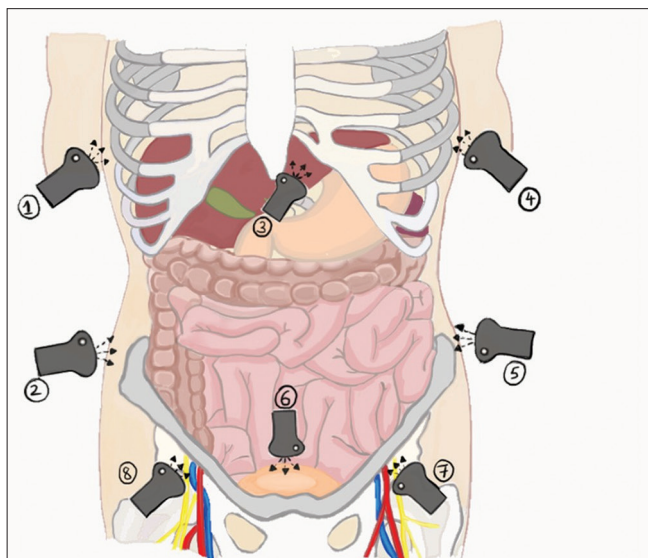
Paracentesis by timely decompression could reduce patients' distress; improve their comfort and quality of life. Avoiding unnecessary paracentesis if fluid levels are not significant enough becomes an equally necessary decision in the palliative setting. Assessing the risk versus benefit in individual clinical scenarios would be paramount in determining patient outcome assessment. Loculated ascites and failed paracentesis resulting in a dry tap could be benefited from POCUS-guided intervention.<sup>[1]</sup>

Thoracocentesis guided by POCUS provides an appropriate target site for the insertion of an intercostal chest drain tube. POCUS-guided pigtail catheter insertion which is as effective as the insertion of a chest tube could be performed in a community setting instead of shifting the patient to a hospital setting.<sup>[55]</sup>

Linear high-frequency probes have simplified venous access in a palliative care setting and have rejuvenated pain practice accompanied by palliative care.<sup>[1]</sup>

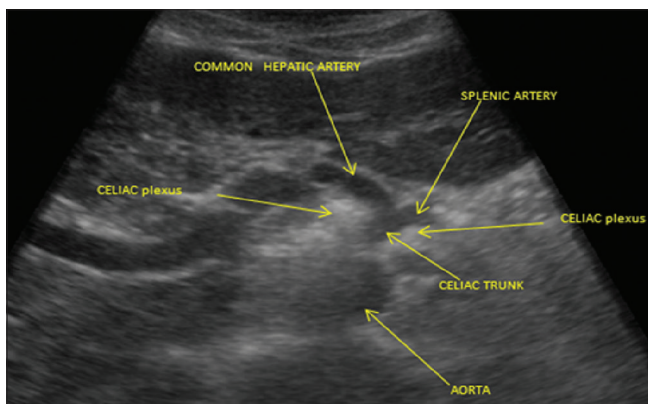
Bedside ultrasound could be used to perform outpatient- and inpatient-based pain management interventions for the control of pain. The bedside ultrasound-guided anterior approach to celiac plexus neurolysis [Figure 8] is a fast, safe and cost-effective method that could help achieve analgesia among selected patients in palliative care units for achieving good quality of life in the advanced stages of upper abdominal cancers.<sup>[56]</sup> The utility of anterior ultrasound guidance to superior hypogastric plexus [Figure 9] and subsequent neurolysis has resulted in effective pelvic cancer pain management in advanced gynaecologic malignancies.<sup>[57]</sup> Performance of visceral sympathetic blocks, peripheral nerve blocks, fascial plane blocks, ganglion blocks, musculoskeletal pain interventions, corticosteroid injections, botulinum toxin injections (for troublesome siallorrhea secondary to progressive neurological diseases) and securing definitive vascular access are POCUS-based interventions in palliative care setup.<sup>[1,10,58]</sup>

POCUS applications possess the advantage over other conventional modalities of radiological imaging (X-ray, fluoroscopy and computed tomography) by being available bedside, avoiding ionising radiation exposure, the risk associated with contrast exposure, function as a combined diagnostic as well as an interventional tool, portable and bring cost efficacy. Renal damage secondary to intravenous contrast in a debilitated patient may predispose to further debility. Pain interventions involving posterior neuraxis, peri-neuraxial, stimulatory or neuroablative procedures,



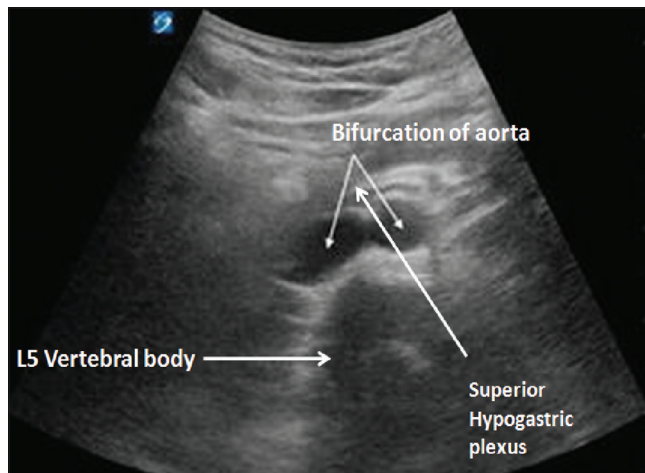
1. Right lung base and right upper quadrant
2. Right lower quadrant abdomen
3. Subxiphoid cardiac view
4. Left lung base and left upper abdomen
5. Left lower quadrant abdomen
6. Suprapubic pelvic view
7. Compression ultrasound of femoral vessels - Left
8. Compression ultrasound of femoral vessels - Right

**Figure 7:** Schematic image showing 8-point palliative medicine point-of-care ultrasound protocol examination for the assessment of patient in palliative care medicine.



**Figure 8:** USG image showing coeliac trunk with coeliac plexus for coeliac plexus block for upper abdominal pain management.

perineural block, fascial plane block and skeletal joint-related pain procedure could be transformed into a safe performance by POCUS application.<sup>[59]</sup> A significant learning curve is associated with acquiring an ultrasound skill set,



**Figure 9:** USG image showing bifurcation of abdominal aorta at L5 vertebral body level and superior hypogastric plexus for superior hypogastric plexus block for pelvic pain management.

necessitating dedicated POCUS training which becomes crucial to safe and successful practice.

### MINIMISING PATIENT TRANSPORT IN PALLIATIVE CARE

Palliative home care has many challenges, wherein serious health-related issues may need acute bedside management, especially because of severe illness in patients presenting with end-of-life care. The imperative goal of home care would be to limit hospital emergency visits culminating in inpatient admission and prevent acute decompensation. Restricting patient transport in a decompensated state may be more prudent near end-of-life care which could be extremely stressful for the patient and caregivers.<sup>[60,61]</sup>

‘POCUS first’ diagnostic strategies aim to reduce hospital visits and improve the quality of life in a patient who is already mobility constrained.<sup>[62]</sup> It provides flexibility in planning for future hospital visits if needed, by providing a baseline assessment.

The greatest utility of ultrasound is in avoiding patient shifting and administering contrast injections in palliative care patients. POCUS should become the first-line testing, following which a contrast-based computed tomography could be considered if needed on initial POCUS evaluation, rather than initiating it in an already decompensated patient.<sup>[1,62,63]</sup>

This is especially true in the case of inoperable metastatic peritoneal tumours, wherein POCUS provides just enough pragmatic information clinically at the bedside, rather than subjecting to repeated patient shifting for higher imaging requisites. Whereas in a patient, with no previous established malignancy, presenting with pain abdomen, suggestive of an acute or subacute intestinal obstruction, POCUS should be the starting point of the diagnostic evaluation pathway in an outpatient setting.<sup>[1]</sup>

## Limitations of POCUS

However, the application of POCUS in a palliative care setting does have a few individualised limitations. Understanding the sensitivity and specificity of each POCUS application needs to be considered. There is an interobserver performer variability in the conduct and final interpretation of a given POCUS finding. Individual patient factors coupled with operator expertise need to be considered in the final interpretation.

Further expert opinions may be needed and should be sought in individualised patients. Safety in patient care becomes paramount and competency needs to be established in preventing errors in clinical management.<sup>[24]</sup>

The need to bring in quality accreditation by incorporating dedicated POCUS training within palliative medicine is probably a necessity moving forward. The need to embrace POCUS in palliative medicine brings forth a new dimension, in the identification of diagnostic and interventional procedures which could be performed at home, in hospice and in specialised palliative care settings.<sup>[24]</sup>

Palliative care physician cares for multiorgan system specialities and tries to supplement the optimal functionality of the organs by symptom control, but POCUS helps to triage these patients to respective organ specialities for optimal and timely management.

## CONCLUSION

Palliative care physicians should be enabled to carry out bedside ultrasound at home care, old age homes, organisational long-term care areas as well as hospice setting for achieving rapid symptom relief and providing patient comfort as a priority. The goal of POCUS should not be constrained by the restrictive laws against the use of handheld portable ultrasound devices (preconception and prenatal diagnostic techniques act).

Ultrasound devices should become compact, portable and easily accessible towards empowering home-based outreach palliative care. Visits to the hospital emergency department could be minimised by the application of POCUS as a diagnostic and interventional modality, especially during end-of-life care. Handheld devices should become the future of POCUS in paracentesis, thoracentesis, and chronic pain interventions. POCUS performed bedside should become the benchmark standard of palliative care.

The goal of POCUS is neither a replacement for formal imaging nor to be a complete evaluation. POCUS needs to be used as an extension of physical examination seeking specifically focused endpoints in reaching a meaningful diagnosis and reducing treatment delays. This could expedite diagnosis as well as provide risk stratification in patients who are terminally ill and movement-constrained. POCUS should become the first diagnostic modality applied bedside in palliative care, before subjecting the patient to further higher imaging modalities.

## Acknowledgement

1. We would like to extend our thanks to the Department of Radiology, Tata Memorial Centre, Homi Bhabha National Institute, Parel, Mumbai-400012, for providing us with the ultrasound images [Figures 1-5, 8 and 9]
2. We would like to extend our thanks to Dr. Benjamin Galen, MD, Editor-In-Chief, of POCUS JOURNAL, for permitting us to use [Figure 6]
3. We would like to extend our thanks to Dr. Prathiba Thiagarajan, Specialty Doctor, Department of Anaesthesia and Critical Care, University Hospital of Leicester, United Kingdom, for providing her help for [Figure 7].

## Declaration of patient consent

Patient's consent not required as patients' identity is not disclosed or compromised.

## Financial support and sponsorship

Nil.

## Conflicts of interest

Dr. Raghavendra Ramanjulu is the Editor-in-Chief of the journal.

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**How to cite this article:** Thota RS, Ramkiran S, Ramanjulu R. Time to FOCUS - 'Palliative medicine point-of-care ultrasound.' *Indian J Palliat Care* 2023;29:36-45.