sciendo Acta Marisiensis - Seria Medica 2025;71(2):91-94 DOI: 10.2478/amma-2025-0021

REVIEW

# Point-of-care ultrasound in palliative care management of malignant pleural effusion in outpatients and nursing home residents: A narrative review

Corina Marginean[1], Bianca Emilia Ciurba[2*], Bianca Liana Grigorescu[3]

1. Pulmonology Department, Mures County Clinical Hospital, Targu Mures, Romania; Oncology Department, George Emil Palade University of Medicine, Pharmacy, Science, and Technology of Targu Mures, Romania
2. Pulmonology Department, Bistrita County Emergency Clinical Hospital, Bistrita, Romania
3. Anesthesiology and Intensive Therapy Department, Emergency Mures County Clinical Hospital, Targu Mures, Romania; Anesthesiology and Intensive Therapy Department, George Emil Palade University of Medicine, Pharmacy, Science, and Technology of Targu Mures, Romania

Early integration of palliative care for patients with malignant pleural effusion (MPE) significantly improves symptom control, quality of life, and reduces healthcare costs. Despite well-developed palliative care services in Romania, timely access to multidisciplinary care remains challenging, particularly in outpatient settings and nursing homes. Point-of-Care Ultrasound (POCUS) has emerged as a valuable diagnostic and therapeutic tool in managing malignant pleural effusions within various clinical settings, including hospitals, outpatient clinics, home care, and nursing homes. Its diagnostic advantages include high accuracy in identifying small effusions and differentiating malignant from benign conditions. Therapeutically, POCUS significantly enhances the safety and effectiveness of procedures such as thoracentesis, reducing complications and the need for hospital transfers.

This review highlights how POCUS aligns with key palliative care principles by alleviating patient burden and enhancing comfort. We advocate for its adoption as standard practice in both inpatient and outpatient palliative care, supported by targeted training and standardized protocols. Further studies should assess the long-term clinical benefits and economic implications of routine POCUS use in palliative care.

**Keywords**: pleural effusion, lung ultrasound, thoracentesis, palliative care

Received 9 November 2024 / Accepted 6 May 2025

## Introduction

Palliative care is an interdisciplinary medical approach aimed at relieving suffering and improving the quality of life for patients with serious, life-limiting conditions [1]. Among these, malignant pleural effusion (MPE) is a common and distressing complication, affecting up to 15% of patients with advanced cancer—most frequently those with lung cancer, breast carcinoma, or lymphomas [2,3]. MPE refers to the accumulation of fluid in the pleural space due to malignant infiltration, which restricts lung expansion and often leads to severe breathlessness, anxiety, and fatigue. MPE contributes significantly to dyspnea, anxiety, and reduced functional status, making its effective management a critical component of palliative care.

Recent evidence supports the increasing use of Point-of-Care Ultrasound (POCUS) across diverse palliative settings—not only for pleural effusions, but also for ascites, heart failure, and pneumonia [4]. Portable, affordable, and user-friendly ultrasound devices have enabled the integration of POCUS into bedside care, reducing hospitalizations and improving the efficiency of symptom management.

This narrative review aims to explore the diagnostic and therapeutic applications of POCUS in managing malignant pleural effusion, with a particular focus on its use in outpatient and nursing home settings. By evaluating current evidence, this review underscores both the clinical benefits and implementation challenges of POCUS in palliative care.

## Pathophysiology and Classification of Pleural Effusions

Pleural effusion refers to the pathological accumulation of fluid in the pleural space, significantly affecting morbidity, mortality, healthcare costs, and patient quality of life. Effusions are generally categorized as transudates or exudates, based on their underlying mechanism. Transudative effusions result from systemic factors such as increased hydrostatic pressure or decreased oncotic pressure, commonly seen in heart failure or liver cirrhosis. In contrast, exudative effusions occur due to increased capillary permeability caused by malignancy, infection, inflammation, or pulmonary embolism [5].

Exudates can be distinguished from transudates using Light's criteria, which are summarized in Table 1. These criteria remain the standard approach for determining the nature of a pleural effusion based on protein and lactate dehydrogenase (LDH) levels in pleural fluid and serum [6].

Malignant pleural effusions (MPE) are typically exudative and often present with high pleural LDH, elevated

* Correspondence to: Bianca Emilia Ciurba
E-mail: biancaciurba@outlook.com

Table 1. Light's Criteria for Differentiating Exudative and Transudative Pleural Effusions

| Parameter | Exudate | Transudate |
|---|---|---|
| Pleural fluid/serum protein ratio | > 0.5 | ≤ 0.5 |
| Pleural fluid/serum LDH ratio | > 0.6 | ≤ 0.6 |
| Pleural fluid LDH | > 2/3 of the upper limit of normal serum LDH | ≤ 2/3 of the upper limit of normal serum LDH |

Note: The presence of any one of these three criteria is sufficient to classify an effusion as exudative.

protein levels, and low pleural pH, which together support the diagnosis of malignancy [7].

MPE occurs in up to 30% of patients with advanced malignancies, particularly those with lung, breast, ovarian, gastrointestinal cancers, lymphomas, or mesothelioma [8–9]. It may represent the first sign of cancer or indicate recurrence. Small effusions (<500 mL) are often asymptomatic but can enlarge rapidly, leading to significant respiratory compromise. Clinical manifestations vary by volume and rate of fluid accumulation and may include progressive dyspnea, non-productive cough, chest discomfort, fatigue, weight loss, and impaired physical function [10–11].

In approximately two-thirds of cases, pleural effusion is the initial manifestation of malignancy—especially in patients with lymphatic obstruction by squamous cell carcinoma [12–13]. Without timely and appropriate management, MPE can lead to rapid deterioration in respiratory function and reduced survival, underscoring the importance of early palliative interventions aimed at symptom relief and improved quality of life [14].

## Diagnostic Approaches in Malignant Pleural Effusion

Thoracic ultrasound has proven to be a highly sensitive tool for detecting pleural effusions, capable of identifying fluid volumes as small as 5 mL—far surpassing the sensitivity of chest radiography, which typically detects effusions only above 200 mL. Ultrasound imaging allows real-time visualization of fluid collections, facilitating both diagnostic clarity and procedural safety, especially in advanced-stage illnesses such as stage IV lung cancer. In this context, ultrasound-guided thoracentesis improves precision and reduces the risk of complications, thereby enhancing symptom control in palliative care patients.

Point-of-Care Ultrasound (POCUS) can also assist in distinguishing malignant from benign effusions when interpreted in conjunction with clinical and laboratory findings. Its bedside applicability and portability make it especially valuable in frail or immobile patients.

## Management of MPE in Palliative Care

Palliative care focuses on relieving symptoms and improving quality of life across all stages of serious illness, from diagnosis to end-of-life care. Early integration of palliative care alongside standard oncology treatment has been shown to improve symptom control, emotional well-being, patient satisfaction, and to reduce overall healthcare expenditures [15,16].

Patients with advanced respiratory diseases—particularly those with lung cancer—frequently experience distressing symptoms such as dyspnea, anxiety, depression, malignant pleural effusions, airway obstruction, and pulmonary embolism. These complications require coordinated, interdisciplinary care that addresses both physical and psychosocial burdens [17].

A variety of palliative care delivery models exist, including hospital-based, outpatient, home-based, nursing home-based, and hospice-based programs [18]. Each model addresses distinct patient and caregiver needs by emphasizing early screening, regular reassessment, and proactive management of evolving symptoms. Importantly, palliative care programs contribute to healthcare system sustainability by reducing hospitalizations, emergency department visits, and intensive care unit utilization [19–22].

Successful delivery of palliative care—particularly for respiratory and pleural diseases—relies on close collaboration between pulmonologists and palliative care teams. This integrated approach allows for timely symptom relief, management of psychosocial and spiritual distress, and support for families and caregivers throughout the illness trajectory [23–25].

Expanding access to high-quality palliative care in outpatient and long-term care settings remains a priority. Doing so not only improves outcomes for patients with life-limiting respiratory conditions, but also enhances overall well-being for their caregivers.

## Ultrasound-Guided Thoracentesis: Clinical Benefits and Limitations

POCUS has become an essential tool in the diagnosis and management of MPE. Thoracic ultrasound enables accurate detection of pleural fluid, assists in distinguishing between benign and malignant effusions, and plays a crucial role in guiding thoracentesis safely and effectively [26–30]. Compared to blind procedures, POCUS-guided thoracentesis is associated with higher success rates, fewer complications, and greater patient safety and satisfaction [31].

The portability, affordability, and real-time imaging capabilities of POCUS support its widespread use in outpatient clinics, nursing homes, and home-based palliative care. This approach minimizes the need for hospital transfers and accelerates the delivery of symptom relief [32-39]. Early bedside use of lung ultrasound can also assist in identifying serious complications common in advanced cancer patients—such as pulmonary embolism, pneumothorax, and pneumonia—further enhancing diagnostic accuracy in resource-limited settings [40–41].

While thoracentesis can effectively relieve dyspnea and improve respiratory function, its palliative benefit is often temporary. In cases of recurrent MPE, patients may require

multiple procedures over time [42–50]. Therefore, implementing standardized protocols and comprehensive training in POCUS is essential for ensuring its safe, consistent use across diverse care environments [51–52]. Expanding access to ultrasound-guided thoracentesis within multidisciplinary palliative teams can improve outcomes and reduce procedural risks, especially in vulnerable populations such as the elderly or nursing home residents.

## Implementation Challenges in Outpatient and Long-Term Care Settings

Although palliative care services in Romania are well developed in specialized centers, access to timely and multidisciplinary care remains limited in outpatient clinics and long-term care facilities. The successful integration of POCUS into these settings faces several challenges, including limited training, insufficient equipment, and inconsistent practice guidelines.

Addressing these barriers requires institutional commitment, the development of tailored training programs, and collaboration between policymakers and healthcare professionals to expand the reach of palliative interventions.

## Conclusions

Point-of-Care Ultrasound (POCUS) is a valuable diagnostic and therapeutic tool in the palliative management of malignant pleural effusions. Its key advantages—such as real-time fluid localization, improved procedural safety, and immediate symptom relief through ultrasound-guided thoracentesis—directly contribute to better respiratory function and enhanced patient comfort. By improving ventilation-perfusion balance and minimizing complications, POCUS aligns closely with the goals of palliative care, particularly in improving quality of life.

Given its portability and cost-efficiency, POCUS enables safe implementation of thoracentesis and other procedures in outpatient, hospice, and home-based settings, thereby reducing unnecessary hospital admissions and lowering healthcare costs.

We recommend the routine integration of POCUS into palliative care protocols across all levels of service delivery. To support this, standardized training and practice guidelines should be developed for healthcare professionals involved in palliative care. Future research should further evaluate the long-term clinical outcomes, cost-effectiveness, and broader role of POCUS in advancing patient-centered, value-based care.

## Authors contributions

CM - Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Resources, Supervision, Visualization, Writing – original draft, Writing – review & editing.

BEC - Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Resources, Visualization, Writing – review & editing.

BLG - Conceptualization, Data curation, Formal Analysis, Investigation, Methodology, Project administration, Resources, Supervision, Visualization, Writing – original draft, Writing – review & editing.

## Conflict of interest

None to declare.

## Funding

No external funding was received

## References

1. Ferrell BR, Twaddle ML, Melnick A, Meier DE. National Consensus Project Clinical Practice Guidelines for Quality Palliative Care Guidelines, 4th Edition. J Palliat Med. 2018;21(12):1684-1689. doi:10.1089/jpm.2018.0431
2. Clive AO, Jones HE, Bhatnagar R, Preston NJ, Maskell N. Interventions for the management of malignant pleural effusions: a network meta-analysis. Cochrane Database Syst Rev. 2016;2016(5):CD010529. Published 2016 May 8. doi:10.1002/14651858.CD010529.pub2
3. American Thoracic Society. Management of malignant pleural effusions. Am J Respir Crit Care Med. 2000;162(5):1987-2001. doi:10.1164/ajrccm.162.5.ats8-00
4. Arya A, Davey R, Sharma A, et al. Utilization of Point-of-Care Ultrasound in a Specialist Palliative Care Team Across Multiple Care Settings: A Retrospective Chart Review. Palliat Med Rep. 2022;3(1):229-234. Published 2022 Oct 21. doi:10.1089/pmr.2021.0067
5. Liu RB, Donroe JH, McNamara RL, Forman HP, Moore CL. The Practice and Implications of Finding Fluid During Point-of-Care Ultrasonography: A Review. JAMA Intern Med. 2017;177(12):1818-1825. doi:10.1001/jamainternmed.2017.5048
6. Mercer RM, Corcoran JP, Porcel JM, Rahman NM, Psallidas I. Interpreting pleural fluid results . Clin Med (Lond). 2019;19(3):213-217. doi:10.7861/clinmedicine.19-3-213
7. Feller-Kopman D, Light R. Pleural Disease. N Engl J Med. 2018;378(8):740-751. doi:10.1056/NEJMra1403503
8. Nemanič, Tiva, et al. Biomarkers in routine diagnosis of pleural effusions. Slovenian Medical Journal 87.1-2 (2018): 15-21
9. Antunes G, Neville E, Duffy J, Ali N. BTS guidelines for the management of malignant pleural effusions. Thorax. 2003;58 (Suppl 2): ii29–ii38.
10. Sahn SA. Pleural diseases related to metastatic malignancies. Eur Respir J. 1997;10:1907–1901.
11. Desai NR, Lee HJ. Diagnosis and management of malignant pleural effusions: state of the art in 2017. J Thorac Dis. 2017;9(Suppl 10):S1111-S1122. doi:10.21037/jtd.2017.07.79
12. Chernow B, Sahn SA. Carcinomatous involvement of the pleura: an analysis of 96 patients. Am J Med. 1977;63(5):695-702. doi:10.1016/0002-9343(77)90154-1
13. Porcel JM, Solé C, Salud A, Bielsa S. Prognosis of Cancer with Synchronous or Metachronous Malignant Pleural Effusion. Lung. 2017;195(6):775-779. doi:10.1007/s00408-017-0050-1
14. Ryu JS, Lim JH, Lee JM, et al. Minimal Pleural Effusion in Small Cell Lung Cancer: Proportion, Mechanisms, and Prognostic Effect. Radiology. 2016;278(2):593-600. doi:10.1148/radiol.2015142388
15. Penz E, Watt KN, Hergott CA, Rahman NM, Psallidas I. Management of malignant pleural effusion: challenges and solutions. Cancer Manag Res. 2017;9:229-241. Published 2017 Jun 23. doi:10.2147/CMAR.S95663
16. Joshua B. Kayser , Kim Mooney-Doyle, Paul N. Lanken. Chapter 1. Definitions and policy. ERS monograph: Palliative Care in Respiratory Disease, pages 1-18.
17. Quint LE. Thoracic complications and emergencies in oncologic patients. Cancer Imaging. 2009;9 Spec No A(Special issue A):S75-S82. Published 2009 Oct 2. doi:10.1102/1470-7330.2009.9031
18. Postier A, Chrastek J, Nugent S, Osenga K, Friedrichsdorf SJ. Exposure to home-based pediatric palliative and hospice care and its impact on hospital and emergency care charges at a single institution. J Palliat Med. 2014;17(2):183-188. doi:10.1089/jpm.2013.0287
19. Scibetta C, Kerr K, Mcguire J, Rabow MW. The Costs of Waiting: Implications of the Timing of Palliative Care Consultation among a Cohort of Decedents at a Comprehensive Cancer Center. J Palliat Med. 2016;19(1):69-75. doi:10.1089/jpm.2015.0119

20. Greer JA, Tramontano AC, McMahon PM, et al. Cost Analysis of a Randomized Trial of Early Palliative Care in Patients with Metastatic Nonsmall-Cell Lung Cancer. J Palliat Med. 2016;19(8):842-848. doi:10.1089/jpm.2015.0476
21. Ruck JM, Canner JK, Smith TJ, Johnston FM. Use of Inpatient Palliative Care by Type of Malignancy. J Palliat Med. 2018;21(9):1300-1307. doi:10.1089/jpm.2018.0003
22. May P, Garrido MM, Cassel JB, et al. Prospective Cohort Study of Hospital Palliative Care Teams for Inpatients With Advanced Cancer: Earlier Consultation Is Associated With Larger Cost-Saving Effect. J Clin Oncol. 2015;33(25):2745-2752. doi:10.1200/JCO.2014.60.2334
23. Bernard Higgins, Tim Peel, and Paula Mulvenna. Integrated Palliative Care of Respiratory Disease, Second Edition, chapter 6, Lung Cancer, pages 77-99
24. Colligan EM, Ewald E, Ruiz S, Spafford M, Cross-Barnet C, Parashuram S. Innovative Oncology Care Models Improve End-Of-Life Quality, Reduce Utilization And Spending. Health Aff (Millwood). 2017;36(3):433-440. doi:10.1377/hlthaff.2016.1303
25. Temel JS, Greer JA, Muzikansky A, et al. Early palliative care for patients with metastatic non-small-cell lung cancer. N Engl J Med. 2010;363(8):733-742.
26. Liu RB, Donroe JH, McNamara RL, Forman HP, Moore CL. The Practice and Implications of Finding Fluid During Point-of-Care Ultrasonography: A Review. JAMA Intern Med. 2017;177(12):1818-1825.
27. Sabrina Bajwah , Eve Namisango, Daisy J.A. Janssen et al., Chapter 2 The need for palliative care. ERS monograph: Palliative care in respiratory disease, pages 21-30
28. Breakey N, Osterwalder J, Mathis G, Lehmann B, Sauter TC. Point of care ultrasound for rapid assessment and treatment of palliative care patients in acute medical settings. Eur J Intern Med. 2020;81:7-14.
29. Miles MJ, Islam S. Point of care ultrasound in thoracic malignancy. Ann Transl Med. 2019;7(15):350. doi:10.21037/atm.2019.05.53
30. Safai Zadeh E, Weide J, Dietrich CF, Trenker C, Koczulla AR, Görg C. Diagnostic Accuracy of B-Mode- and Contrast-Enhanced Ultrasound in Differentiating Malignant from Benign Pleural Effusions. Diagnostics (Basel). 2021;11(7):1293. Published 2021 Jul 19. doi:10.3390/diagnostics11071293
31. Patel PA, Ernst FR, Gunnarsson CL. Ultrasonography guidance reduces complications and costs associated with thoracentesis procedures. J Clin Ultrasound. 2012;40(3):135-141. doi:10.1002/jcu.20884
32. Chen HJ, Tu CY, Ling SJ, et al. Sonographic appearances in transudative pleural effusions: not always an anechoic pattern. Ultrasound Med Biol. 2008;34(3):362-369. doi:10.1016/j.ultrasmedbio.2007.09.009
33. Shkolnik B, Judson MA, Austin A, et al. Diagnostic Accuracy of Thoracic Ultrasonography to Differentiate Transudative From Exudative Pleural Effusion. Chest. 2020;158(2):692-697. doi:10.1016/j.chest.2020.02.051
34. Koenig SJ, Narasimhan M, Mayo PH. Thoracic ultrasonography for the pulmonary specialist. Chest. 2011;140(5):1332-1341. doi:10.1378/chest.11-0348
35. Mariani PJ, Setla JA. Palliative ultrasound for home care hospice patients. Acad Emerg Med. 2010;17(3):293-296. doi:10.1111/j.1553-2712.2009.00678.x
36. Ben-Baruch Golan Y, Sadeh R, Mizrakli Y, et al. Early Point-of-Care Ultrasound Assessment for Medical Patients Reduces Time to Appropriate Treatment: A Pilot Randomized Controlled Trial. Ultrasound Med Biol. 2020;46(8):1908-1915. doi:10.1016/j.ultrasmedbio.2020.03.023
37. Mallow C, Hayes M, Semaan R, et al. Minimally invasive palliative interventions in advanced lung cancer. Expert Rev Respir Med. 2018;12(7):605-614. doi:10.1080/17476348.2018.1486709
38. Kanai M, Sekiguchi H. Avoiding vessel laceration in thoracentesis: a role of vascular ultrasound with color Doppler. Chest. 2015;147(1):e5-e7. doi:10.1378/chest.14-0814
39. Chernack B, Knowlton SE, Kohler MJ. The Use of Ultrasound in Palliative Care and Hospice. Am J Hosp Palliat Care. 2017;34(4):385-391. doi:10.1177/1049909115625960
40. Lichtenstein DA, Mezière GA. Relevance of lung ultrasound in the diagnosis of acute respiratory failure: the BLUE protocol [published correction appears in Chest. 2013 Aug;144(2):721]. Chest. 2008;134(1):117-125. doi:10.1378/chest.07-2800
41. Chen WL, Chung CL, Hsiao SH, Chang SC. Pleural space elastance and changes in oxygenation after therapeutic thoracentesis in ventilated patients with heart failure and transudative pleural effusions. Respirology. 2010;15(6):1001-1008. doi:10.1111/j.1440-1843.2010.01812.x
42. Dini, Frank Lloyd, Carlo Bergamini, Aldo Allegrini, Massimo Scopelliti, et al. Bedside Wireless Lung Ultrasound for the Evaluation of COVID-19 Lung Injury in Senior Nursing Home Residents. Monaldi Archives for Chest Disease 2020; 90(3):1446. DOI:10.4081/monaldi.2020.1446
43. Zielinska-Krawczyk M, Stecka AM, Grabczak EM, et al. Impact of therapeutic thoracentesis and pleural pressure changes on breathing pattern, dyspnea, lung function, and arterial blood gases. Pol Arch Intern Med. 2022;132(4):16185. doi:10.20452/pamw.16185
44. Chen WL, Chung CL, Hsiao SH, Chang SC. Pleural space elastance and changes in oxygenation after therapeutic thoracentesis in ventilated patients with heart failure and transudative pleural effusions. Respirology. 2010;15(6):1001-1008. doi:10.1111/j.1440-1843.2010.01812.x
45. Perpiñá M, Benlloch E, Marco V, Abad F, Nauffal D. Effect of thoracentesis on pulmonary gas exchange. Thorax. 1983;38(10):747-750. doi:10.1136/thx.38.10.747
46. Sahn SA. Management of malignant pleural effusions. Monaldi Arch Chest Dis. 2001;56(5):394-399.
47. Heffner JE. Diagnosis and management of malignant pleural effusions. Respirology. 2008;13(1):5-20. doi:10.1111/j.1440-1843.2007.01154.x
48. Feller-Kopman D, Walkey A, Berkowitz D, Ernst A. The relationship of pleural pressure to symptom development during therapeutic thoracentesis. Chest. 2006;129(6):1556-1560. doi:10.1378/chest.129.6.1556
49. Segaline N, Wang J, Bethancourt B, Ota KS. The Role of Ultrasound-Guided Therapeutic Thoracentesis in an Outpatient Transitional Care Program: A Case Series. Am J Hosp Palliat Care. 2019;36(10):927-931. doi:10.1177/1049909119837517
50. Grosu HB, Molina S, Casal R, et al. Risk factors for pleural effusion recurrence in patients with malignancy. Respirology. 2019;24(1):76-82. doi:10.1111/resp.13362
51. Canadian Society of Palliative Care Physicians. Palliative POCUS Course. Available: https://education.emlondon.ca/course/view.php?id=9.
52. Torres-Macho J, Aro T, Bruckner I, et al. Point-of-care ultrasound in internal medicine: A position paper by the ultrasound working group of the European federation of internal medicine. Eur J Intern Med. 2020;73:67-71. doi:10.1016/j.ejim.2019.11.016