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A ultrassonografia aplicada aos cuidados primários de saúde: relato de caso

Point of Care ultrasonography use in primary care: a case report

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Resumo

O artigo descreve um caso clínico no qual a ultrassonografia *Point of Care* foi utilizada por um técnico de radiologia especializado em ecografia e um médico da especialidade de Medicina Geral e Familiar, durante uma consulta em regime de ambulatório. O objetivo principal é evidenciar o papel crucial da ultrassonografia como ferramenta de apoio à decisão clínica em tempo real, realizada de forma autônoma. O caso reflete os desafios enfrentados por profissionais dos cuidados de saúde primários em ambientes periféricos com recursos tecnológicos limitados, destacando a importância da ecografia na melhoria da eficiência e precisão diagnóstica nesses contextos. Uma paciente deslocou se a uma consulta com o seu médico de família, numa unidade de saúde de cuidados primários, com dificuldade respiratória progressiva. A paciente tinha sido internada quatro meses antes devido a um derrame pleural bilateral de origem desconhecida, diagnosticado através de tomografia computadorizada. Uma segunda tomografia computadorizada de acompanhamento foi realizada de forma ambulatorial, revelando um novo pequeno derrame pericárdico e derrames pleurais bilaterais persistentes.

À medida que a condição da paciente continuava a piorar, o médico de Medicina Geral e de Familiar solicitou uma radiografia pulmonar, e uma avaliação ultrassonográfica dos achados da radiografia, para verificar o estado do paciente. Os achados radiológicos e ultrassonográficos, constataram um aumento substancial do derrame pericárdico, bem como dos derrames pleurais bilaterais. Mediante o agravamento do quadro clínico da doente, o médico de família encaminha a paciente para um hospital de referência, a fim de realizar uma avaliação mais detalhada e proporcionar o tratamento adequado.

Palavras-chave: Cuidados Primários, Derrame Pleural, Derrame Pericárdico, *Point of Care*, Ultrassom

Abstract

This study presents a case in which point-of-care ultrasonography was used by a radiographer and a General and Family Medicine Physician in a primary care health unit as a decision-making tool for an outpatient clinical case. The objective of this report is to demonstrate the usefulness of sonography as a decision-making tool, to aid in a peripheral and with limited technological resources primary care health unit.

A patient was admitted to a primary care health unit with worsening breathing difficulty. The patient had a prior hospitalization four months earlier due to a bilateral pleural effusion of unknown origin, which was diagnosed by computed tomography. A follow-up computed tomography scan was performed on an outpatient basis, revealing a new small pericardial effusion and persistent bilateral pleural effusions.

As the patient's condition continued to worsen, General and Family Medicine Physician ordered lung radiography, and a sonographic evaluation was done by the radiographer to access the patient's condition.

Based on the radiological findings, there is clear evidence of a substantial increase in the patient's pericardial effusion. This, in conjunction with the patient's current clinical state, warrants a transfer to a referral hospital (RH)for further evaluation and treatment.

Keywords: Primary Care, Pleural Effusion; Pericardial Effusion, Point-of-Care, Ultrasound

Introduction

Point-of-care ultrasonography (POCUS) has rapidly gained acceptance as a global standard of care, with training programs worldwide promoting its use to enhance patient care, minimize risks to patients, and reduce unnecessary referrals and investigations. The use of POCUS is increasingly being adopted by general practitioners, sonographers, and other health-trained professionals(1–3). Although imaging diagnoses are typically the domain of well-defined specialties, in the everyday practice of family medicine, ultrasound can provide valuable imaging indicators that guide clinical decision-making, saving both time and resources in healthcare systems. In particular, POCUS has proven to be an essential tool in primary care, where it aids General and Family Medicine Physician (GFMP)(4–6) in the early identification of conditions, enables more accurate diagnoses, and facilitates efficient management without the need for extensive referrals.

By offering immediate insights during consultations, POCUS helps clinicians make real-time decisions that would otherwise require waiting for results from external imaging centres. This is especially beneficial in busy healthcare systems, where resource allocation is often tight, and quick, cost-effective diagnostic options are needed. Moreover, POCUS is playing an increasingly significant role in monitoring and guiding simple, minimally invasive procedures in outpatient care, making it an invaluable tool for general practitioners and other healthcare professionals.

Case Description

A 71-year-old female was admitted for consultation with her family doctor in a primary care health unit (PCHU) due to progressively worsening breathing difficulty, accompanied by cough with mucous sputum. The patient denied wheezing, fever, or swelling of lower limbs. The patient had a recent hospitalization episode in a referral hospital, where she was diagnosed with Type I Respiratory Failure due to bilateral pleural effusion causing subsegmental atelectasis of the lower lobes bilaterally, which was revealed by a computed tomography (CT) scan, electrocardiogram, and echocardiogram was negative for acute alterations. The patient also had elevated levels of C-reactive protein (CRP) and was subsequently infected with COVID-19 during the hospitalization. After 22 days of hospitalization, the patient experienced recovery and was subsequently released from the healthcare facility with a recommendation to undergo a follow-up CT scan for monitoring purposes.

Two months after first CT scan, the patient underwent a second CT scan in an outpatient clinic, at this time patient was ongoing persistent fatigue. CT revealed the persistence of bilateral pleural effusion(smaller than in the first CT) and the presence of a new small pericardial effusion(7) measuring approximately 10mm.

However, no specific cause for the pericardial or pleural effusions was identified in the second CT report.

The patient aggravated her complaints and decided to consult her family doctor, GFMP order a lung radiography(RX), Figure 1 resumes principal findings of Posteroanterior chest and Left profile X-ray, and respective artificial intelligence evaluation (8,9).

Figure 1. A – *Posteroanterior chest X-ray, showing bilateral costophrenic effacement and mediastinal widening.* ***B*** *Artificial Intelligence analysis (Hot colours represent higher probability suggestions): Atelectasis, Cardiomegaly, Mediastinal widening, and pleural effusion,* ***C****- Lateral projection of Thorax(left) put in evidence pleural effusions and foci of pulmonary densification of undetermined etiology.*

Subsequently, a screening sonography was performed to confirm the radiographic findings. Given the patient's reported clinical history(pleural and pericardial effusions) and respiratory difficulties, the sonographer opted to assess the trinomial structure comprising the lung, heart, and inferior vena cava (IVC), to rule out an emergency frame(10,11).

Figure 2 and figure 3 traduces the main findings through screening sonography, figure 2 represent evidence of bilateral pleural effusion, being more expressive on the right side and the evaluation of the IVC diameter(16.3mm), which proved to be variable according to the respiratory cycle. Figure 3 illustrates the presence of pericardial effusion with clinical significance.

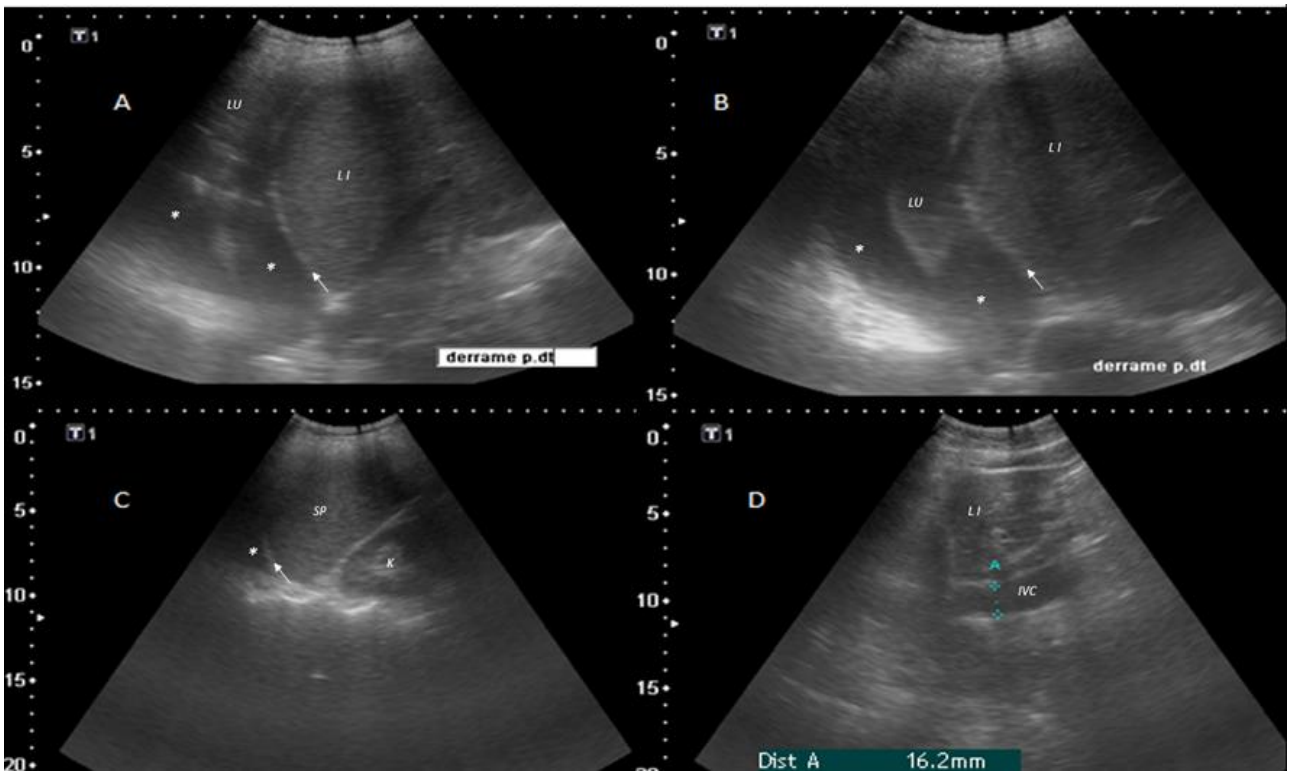

Figure 2. ***A*** *and* ***B*** *Right pleural effusion (anechoic region);* ***C*** *Lef); pleural effusion (anechoic region) ;* ***D*** *Inferior vena cava diameter of 16.2mm, (blue calliper).*(anechoic area; pleural effusion);* ***LI****(liver);* ***LU****(lung);* ***SP****(spleen);* ***K****(kidney);* ***IVC****(Inferior vena cava); wite arrow (diaphragm).*

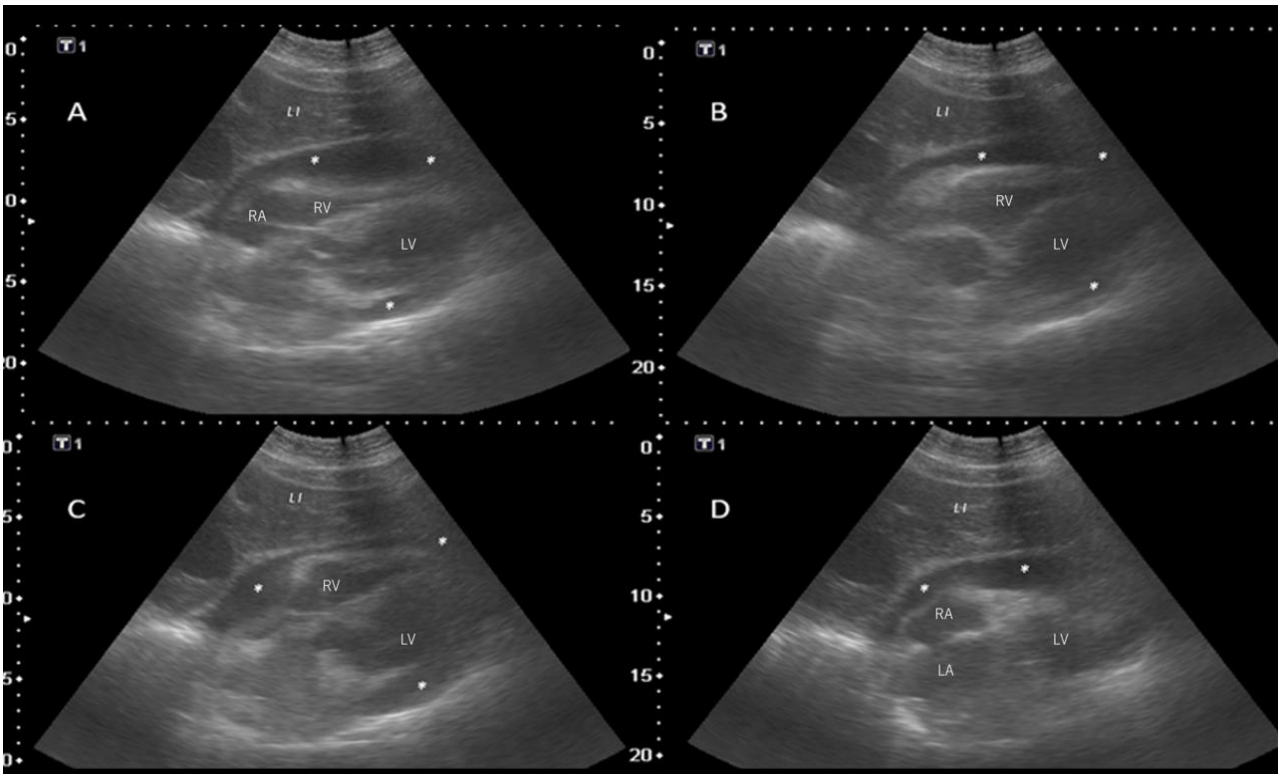

Figure 3. ***A, B, C, D*** *-A, subxiphoid view of heart with anechoic region surrounding the heart chamber representing pericardial fluid (patent anechoic areas surrounding the heart in systole and diastole).* *******(anechoic area; pericardial effusion);* ***LI*** *(liver).* ***RV*** *(right ventricle).* ***LV*** *(left ventricle).* ***RA*** *(right atrium)*

Discussion

Posteroanterior and lateral chest X-ray and sonography confirm the presence of bilateral pleural effusions as described in the previous CT scan. Live sonographic images on right pleurodiaphragmatic side transition allowed to see the “jellyfish sign” which represents of atelectatic lung "swimming" within a large pleural effusion(12–14).

IVC evaluation showed a normal variation collapse well related to respiratory cycle as its normal diameter of 16.2mm which excludes elevated central venous pressure(CVP)(15–17).

Pericardial effusion evaluation through sonography revealed to be significant and above the reported 10mm (distance between pericardial layers) in previous CT exam 10 days before. We obtained sonographic images of pericardial effusion in which fluid stays around all pericardium making pressure to atrial and ventricular walls during da cardiac cycle, making eye bailing evaluation not sufficient to exclude diastolic or systolic function anomalies(18,19).

After analysing and interpreting the chest X-ray and ultrasound images, the doctor has determined that the patient's condition has worsened. The patient is experiencing respiratory difficulty, accentuated fatigue, persistence of pleural effusions, and an increase in pericardial fluid as compared to a CT examination performed 10 days prior. As a result of these findings, the doctor has decided to refer the patient to the urgency of RH. On the same day of referral to the hospital, the patient underwent a new computed tomography scan, which confirmed suspicions of a two-fold increase in the volume of pericardial effusion(20mm). Subsequently, the patient was hospitalized for stabilization and further diagnostic tests to determine the underlying cause(s) of the ongoing pathologies.

Conclusion

The presented case demonstrates the utility of incorporating ultrasound as a complementary diagnostic tool alongside radiological examinations in the daily practice of primary care physicians. In this case, ultrasound was able to detect an increase in pericardial fluid in a patient who had already undergone previous medical investigations. Given that healthcare providers in primary care settings may have limited access to advanced technological resources, the integration of artificial intelligence algorithms in the analysis of chest X-rays, in conjunction with ultrasound, could prove to be a crucial factor in improving patient outcomes.

ETHIC STATEMENT

All examinations were ordered by physicians in an outpatient setting. No patient or institutional data was recorded in compliance with general data protection laws. The patient was informed of the study's objectives, goals, and purposes and consented to participate, as evidenced by the signed informed consent form in Appendix 1. The primary objective was to demonstrate the value and effectiveness of these techniques in remote settings. This study adhered to ethical guidelines for scientific investigation, including the Declaration of Helsinki and the current national general data protection legislation.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

Referências / *References:*

1. Abrokwa SK, Ruby LC, Heuvelings CC, Bélard S. Task shifting for point of care ultrasound in primary healthcare in low- and middle-income countries-a systematic review. eClinicalMedicine [Internet]. 2022;45. Available from: https://www.thelancet.com/action/showPdf?pii=S2589-5370%2822%2900063-3

2. Sorensen B, Hunskaar S. Point-of-care ultrasound in primary care: a systematic review of generalist performed point-of-care ultrasound in unselected populations. Ultrasound J [Internet]. 2019;11(1). Available from: https://doi.org/10.1186/s13089-019-0145-4

3. Fraleigh CDM, Duff E. Point-of-care ultrasound: An emerging clinical tool to enhance physical assessment. Nurse Pract [Internet]. 2022;47(8):14–20. Available from: https://journals.lww.com/tnpj/toc/2022/08000

4. Capizzano JN, O'Dwyer MC, Furst W, Plegue M, Tucker R, Theyyunni N, et al. Current State of Point-of-Care Ultrasound Use within Family Medicine. J Am Board Fam Med [Internet]. 2022;35(4):809–13. Available from: https://deepblue.lib.umich.edu/bitstream/handle/2027.42/174751/809.full.pdf?sequence=2&isAllowed=y

5. Shen-Wagner J, Deutchman M. Point-of-care ultrasound: A practical guide for primary care. Fam Pract Manag [Internet]. 2020;27(6):33–40. Available from: https://www.aafp.org/pubs/fpm/issues/2020/1100/p33.html

6. Andersen CA, Holden S, Vela J, Rathleff MS, Jensen MB. Point-of-care ultrasound in general practice: A systematic review. Ann Fam Med [Internet]. 2019;17(1):61–9. Available from: https://pmc.ncbi.nlm.nih.gov/articles/PMC6342599/

7. Alerhand S, Carter JM. What echocardiographic findings suggest a pericardial effusion is causing tamponade? Am J Emerg Med [Internet]. 2019 Feb 1 [cited 2023 Feb 25];37(2):321–6. Available from: https://doi.org/10.1016/j.ajem.2018.11.004

8. MadreMedia / Lusa. Algarve é " pioneiro " a utilizar raio-x portátil em utentes sem mobilidade MadreMedia / Lusa. 2023; Available from: https://24.sapo.pt/atualidade/artigos/algarve-e-pioneiro-a-utilizar-raio-x-portatil-em-utentes-sem-mobilidade

9. Cidad SI, Servi ARSA. SNS ARS | Algarve Portal do SNS 24. Available from: https://www.arsalgarve.min-saude.pt/cuidados-de-saude-primarios/servico-de-radiologia-da-ars-algarve/

10. Kajimoto K, Madeen K, Nakayama T, Tsudo H, Kuroda T, Abe T. Rapid evaluation by lung-cardiac-inferior vena cava (LCI) integrated ultrasound for differentiating heart failure from pulmonary disease as the cause of acute dyspnea in the emergency setting. Cardiovasc Ultrasound [Internet]. 2012;10(1):1. Available from: Cardiovascular Ultrasound

11. Spevack R, Shukairi M Al, Jayaraman D, Dankoff J, Rudski L, Lipes J. Serial lung and IVC ultrasound in the assessment of congestive heart failure. Crit Ultrasound J [Internet]. 2017; Available from: https://pubmed.ncbi.nlm.nih.gov/28271386/

12. Radiopaedia Jellyfish sign (ultrasound). Radiopaedia [Internet]. 2020;2020. Available from: https://radiopaedia.org/podcast

13. Han J, Xiang H, Ridley WE, Ridley LJ. Jellyfish sign: Pleural effusion. J Med Imaging Radiat Oncol [Internet]. 2018;62:33. Available from: https://onlinelibrary.wiley.com/doi/epdf/10.1111/1754-9485.20_12785

14. NEPHROPOCUS. NEPHROPOCUS, The jellyfish sign: atelectasis. 2016;1–23. Available from: https://nephropocus.com/2019/07/10/the-jellyfish-sign-atelectasis/

15. Naghipour B, Faridaalaee G. Correlation between Central Venous Pressure and Inferior Vena Cava Sonographic Diameter; Determining the Best Anatomic Location. Emerg (Tehran, Iran) [Internet]. 2016;4(2):83–7. Available from: http://www.ncbi.nlm.nih.gov/pubmed/27274518%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC4893756

16. Ciozda W, Kedan I, Kehl DW, Zimmer R, Khandwalla R, Kimchi A. The efficacy of sonographic measurement of inferior vena cava diameter as an estimate of central venous pressure. Cardiovasc Ultrasound [Internet]. 2016;14(1). Available from: http://dx.doi.org/10.1186/s12947-016-0076-1

17. Goodman A, Perera P, Mailhot T, Mandavia D. The role of bedside ultrasound in the diagnosis of pericardial effusion and cardiac tamponade. J Emergencies, Trauma Shock [Internet]. 2012;5(1):72–5. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3299160/

18. Shabetai R. Pericardial effusion: Haemodynamic spectrum. Heart [Internet]. 2004;90(3):255–6. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1768129/pdf/hrt09000255.pdf

19. Ecope B. Tamponamento cardíaco 22 de abril de 2021 Por Caio Guedes Tamponamento Cardíaco. 2021; Available from: https://blog.escolaecope.com.br/tamponamento-cardiaco/

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