

Original Article / Artigo Original

The Role of the Radiologist with On Site Presence in the Night Shift in a Central Hospital

O Papel do Radiologista em Permanência Física no Período Noturno num Hospital Central

Sara Gama¹, Nuno Campos², Paulo Donato^{1,2}

¹Faculdade de Medicina, Universidade de Coimbra, Coimbra, Portugal
²Serviço de Imagem Médica, Unidade Local de Saúde de Coimbra, Coimbra, Portugal

Address

Sara Cardoso Tolentino Gama
 Faculdade de Medicina da Universidade de Coimbra
 Azinhaga de Santa Comba, Celas
 3000-548 Coimbra, Portugal
 e-mail: saractgama@gmail.com

Received: 06/03/2025

Accepted: 09/07/2025

Published: 31/08/2025



Abstract

Introduction: The aim of this study was to understand the role of the radiologist on-site at night in the emergency department of a central hospital, by analysing the impact of ultrasound examinations on patient management, in particular whether they made it possible to avoid the need for computed tomography.

Methods: An observational, retrospective study analysing the ultrasound scans of 300 consecutive patients who visited the emergency department between 8pm and 8am from 1 to 17 November 2023. The following variables were taken into account: gender, age, date of admission, reason for going to the emergency department, triage, referral from another hospital, reason for having the ultrasound, type of ultrasound, ultrasound diagnosis, time between requesting the test and it being carried out, time between the test being carried out and 8am, orientation after the ultrasound, other imaging tests, final diagnosis, final orientation of the patient, readmission to the emergency department.

Results: A total of 384 ultrasound scans were carried out, which made it possible to orientate or exclude pathology in 91.7% of patients. The remaining patients underwent CT scans to better clarify their condition, totaling 29 exams. There was a readmission rate of 7.5%, considering patients who only underwent an ultrasound assessment on their first visit to the emergency department.

Conclusion: A potential considerable number of CT scans were avoided thanks to access to ultrasound examinations at night, speeding up patient guidance and minimizing unnecessary risks such as high doses of ionizing radiation.

Keywords

Radiologists; Night shift work; Ultrasound imaging; Emergency department.

Resumo

Introdução: Este estudo teve como objetivo a análise do papel do radiologista em permanência física noturna no Serviço de Urgência de um hospital central, avaliando o impacto dos exames ecográficos na orientação dos doentes, particularmente no que se refere à possibilidade de evitar a realização de tomografia computorizada.

Métodos: Estudo observacional e retrospectivo que analisou os exames ecográficos de 300 doentes consecutivos que recorreram ao serviço de urgência entre as 20 horas e as 8 horas da manhã, no período de 1 a 17 de novembro de 2023. Foram consideradas as variáveis: sexo, idade, data de admissão, motivo de ida ao serviço de urgência, triagem, encaminhamento de outro hospital, motivo para realização de ecografia, tipo de ecografia, diagnóstico ecográfico, tempo entre o pedido do exame e a sua realização, tempo entre a realização do exame e as 8 horas da manhã, orientação após a ecografia, outros exames imitológicos, diagnóstico final, orientação final do doente, readmissão no serviço de urgência.

Resultados: Foram realizadas 384 ecografias que permitiram orientar ou excluir patologia em 91,7% dos doentes. Os restantes doentes realizaram tomografia computorizada para melhor esclarecimento do quadro, totalizando 29 exames. Assistiu-se a uma taxa de readmissão de 7,5%, considerando doentes apenas sujeitos a avaliação ecográfica na sua primeira ida ao serviço de urgência.

Conclusão: Foi potencialmente evitada a realização de um número significativo de tomografias computorizadas devido ao acesso aos exames ecográficos durante o período noturno, o que agilizou a orientação dos doentes e minimizou riscos desnecessários, como a exposição a doses elevadas de radiação ionizante.

Palavras-chave

Radiologists; Trabalho noturno; Ecografia; Serviço hospitalar de emergência.

Introduction

In Portugal, there is currently a high daily number of hospital emergency department visits.^{1,2} Additionally, there has been a continued increase in the number of imaging exams performed in emergency departments, particularly computed tomography (CT).³ This uses a significant dose of ionizing radiation, which can have negative health consequences, especially for patients who undergo this imaging method unnecessarily.⁴ Furthermore, the option of performing

CT in the emergency department has been boosted by the advent of teleradiology. The reasons for its increased relevance in clinical practice are numerous,⁵ whether due to the inability to meet the needs of a given area,⁶ or from the perspective of collaboration in the interpretation of complex cases. Teleradiology should represent a resource, sometimes complementary, and should not replace the on-call radiologist.^{7,8} However, this has not been the case in most national hospitals, particularly during the night shift.^{9,10}

Our tertiary center ensures the physical presence of radiologists 24 hours a day, 7 days a week,¹¹ with pediatric radiologists available through a preventative regimen between 8pm and 8am.¹² This allows the discussion with a medical imaging specialist about the most appropriate exam for the patient's clinical situation, who will be present to perform and adapt the protocol of each exam.^{10,13,14} It is also worth noting the possibility of performing operator-dependent exams, such as ultrasound, in the emergency department during the night. This prevents patients from having to wait for the radiologist to arrive the next morning for an ultrasound, or from undergoing another imaging exam less appropriate to their clinical situation, but available via teleradiology, providing information even during the night. However, there may be disadvantages to the operation of the Imaging department, since radiologists who work night shifts are unavailable to work shifts the following day and, in addition, night work is associated with greater exhaustion and a greater risk of burnout among professionals.¹⁵

To date, there is no national analysis that characterizes the importance of ultrasound examinations in the aforementioned context. For this reason, this study aims to understand the impact that ultrasound examinations performed at night (from 8pm to 8am the following day) in the emergency department have on patient management, specifically the number of patients for whom, using only this imaging technique, it was possible to establish a therapeutical plan or rule out any pathology. Furthermore, we also aim to determine the number of patients for whom, despite ultrasound examinations, CT scans were still necessary, being unable to avoid exposure of patients to ionizing radiation. As a secondary objective, we also intend to determine whether the requested ultrasound examinations are consistent with the indications for this imaging technique.

Materials and Methods

An observational, retrospective, and longitudinal study was conducted. The aim was to analyze ultrasound examinations performed on patients who visited the Emergency Department (ED) of this tertiary center during the night, that is, between 8pm and 8am the following morning. Only examinations originating from the ED were evaluated, and any requests deriving from internal emergencies were excluded. The time period considered corresponded to November 1, 2023, through November 17, 2023, inclusive, including minors and pregnant women, for a total of 300 patients.

The variables were collected from the SClínico clinical record program and the SiiMA Vision® imaging management platform. The variables included in this study, stored in a Google Sheets database, were the following: sex, age, date of admission, reason for ED visit, priority level assigned in the initial ED triage (according to the Manchester Triage System),¹⁶ referral from another hospital, clinical suspicion/reason for ultrasound examination, type of ultrasound examination performed, diagnosis indicated by the ultrasound examination, time of the examination, time elapsed between the ultrasound request and its performance, time elapsed between the ultrasound examination and 8am the following morning, post-ultrasound orientation, other imaging examinations the patient was submitted to, final diagnosis, final patient orientation and readmission to the ED.

Reasons to go to ED were organized into several groups: gastrointestinal pathology, urinary pathology, traumatic

pathology, scrotal pathology, breast pathology, joint pathology, soft tissue pathology, vascular pathology, gynecological pathology, salivary gland pathology, and thoracic/respiratory pathology.

The type of ultrasound examination performed corresponds to the anatomical areas targeted in the examination: upper abdominal ultrasound, soft tissue ultrasound, renal and adrenal ultrasound, pelvic ultrasound (suprapubic), bladder ultrasound (suprapubic), scrotal ultrasound, breast ultrasound, salivary gland ultrasound, joint ultrasound, thoracic ultrasound, eFAST (Extended Focused Assessment with Sonography in Trauma).

The diagnosis indicated by the ultrasound examination was, after analysis of the respective reports, coded as "it allows exclusion of pathology or therapeutical orientation" and "it indicates the need for additional studies", due to the inability to exclude pathology or provide orientation.

Regarding the waiting times between the ultrasound request and its performance, and subsequently between the ultrasound and 8am the following morning, an analysis was carried out taking into account two subgroups: from 8pm to 2am the following morning and from 2am to 8am. This division is justified by the institution's ED protocol for adult patients, establishing that only emergent situations of "suspected testicular torsion," "acute abdomen" and "trauma with strong suspicion of thoracoabdominal traumatic injury" are subject to ultrasound evaluation between 2am and 8am.¹⁷ Other imaging tests performed on the patient included Computed Tomography (CT) scans, with or without the use of contrast, and CT scans in the scope of Neuroradiology and radiographs were excluded, as the latter do not need to be reported and, therefore, are not required to be analyzed by a radiologist.

The final diagnosis reached corresponds to the coding performed in the SClínico in the emergency episode, available from a list of codes based on the ICD-10-CM/PCS (International Classification of Diseases 10th Revision-Clinical Modification/Procedure Coding System).¹⁸

Orientation after the ultrasound examination and the final orientation of the patient include the alternatives "discharge" with possible referral for external consultation, "admission", "transfer to other hospitals", "home hospitalization unit", "CT scan" (the latter only in the case of orientation after the ultrasound examination).

Readmission to the ED was assessed only for patients discharged without requiring any imaging exam other than ultrasound. For this purpose, the patient's return to the ED within 1 month of discharge with symptoms similar to those presented at baseline or worsening of these symptoms was considered.

The reason to perform ultrasound on each patient, in the case of adult patients, was analyzed and compared with the hospital's internal document regarding indications for ultrasound in the emergency department.¹⁷ In the case of pediatric patients, it was compared with the indications found in the literature.^{19,20,21} This comparison sought to clarify the percentage of ultrasounds requested that respected the current protocol, as well as which patients would eventually have their diagnosis clarified by CT if teleradiology were only available during the night.

Data relating to pediatric patients were analyzed separately, since radiologists in this care context are on standby at night.¹² Statistical analysis was carried out using IBM SPSS Statistics ® (version 29). The frequency and percentage of each categorical variable and the mean and standard deviation of each continuous variable were determined.

Results

In demographic terms, it was observed that, out of the 300 patients analyzed, 164 (54.7%) were female and 136 (45.3%) were male. The mean age was 56.4 ± 23.2 years (mean \pm standard deviation). A total of 285 adult patients were observed, 218 of whom between 8pm and 2am and the remaining 67 between 2am and 8am. Fifteen pediatric patients were observed.

Regarding the number of patients who went to the ED of this tertiary institution and had to undergo an ultrasound examination at night, that is, they could have been triaged and evaluated before 8pm, but their ultrasound examination was performed after 8pm and until 8am the following morning, it corresponded to 17.6 ± 4.3 (mean \pm standard deviation) per night.

Their priority, according to Manchester triage, was mostly considered "Urgent" in 215 (71.7%) of the cases. There were also 71 (23.7%) cases classified "Very Urgent", 13 (4.3%) "Not Very Urgent" and 1 (0.3%) "Emergency".

The main reason for going to the ED was gastrointestinal pathology, a total of 130 (43.3%) cases, followed by urinary pathology with 86 (28.7%) cases and traumatic pathology with 30 (10%) cases. The remaining ones included vascular pathology with 17 (5.7%) cases, scrotal 15 (5%) cases, soft tissue 9 (3%) cases, joint 5 (1.7%) cases, thoracic/respiratory 3 (1%) cases, mammary 2 (0.7%) cases, salivary glands 2 (0.7%) cases and gynecological 1 (0.3%) case.

There were 31 (10.3%) patients referred from other hospitals, 4 of whom were pediatric patients. The hospitals of Aveiro and Seia stand out, both responsible for referring 5 patients to our center. The remaining hospitals of origin of the patients included non-NHS hospitals (4), the hospitals of Guarda (3), Mealhada (3), Leiria (2), Viseu (2), Castelo Branco (2), Braga (1), Caldas da Rainha (1), Pombal (1), Figueira da Foz (1) and São Francisco Xavier (1).

A total of 384 ultrasound examinations were requested in the ED during the period covered by this study. Their distribution according to the different anatomical areas can be seen in Fig. 1.

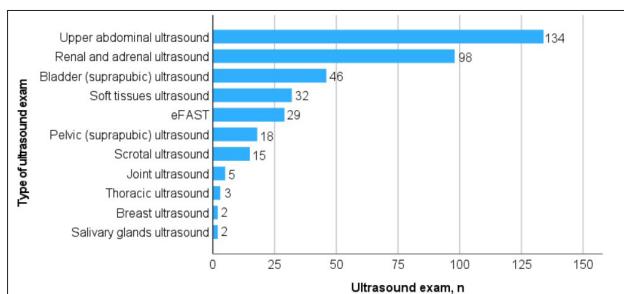


Figure 1 – Distribution of ultrasound examinations by anatomical area.
Legend: eFAST - Extended Focused Assessment with Sonography in Trauma.

Among adult patients, ultrasound examinations were performed on 218 patients between 8pm and 2am, and the reason for the examination was consistent with the department's instructions in 92.7% of cases. Of the 67 patients observed between 2am and 8am, only 37.3% met the criteria for emergent ultrasound: 3 patients with suspected testicular torsion, 20 with suspected acute abdomen and 2 trauma patients with a strong suspicion of thoracoabdominal injury. Of the remaining patients evaluated between 2am and 8am, although they had no indication for emergent ultrasound, 85.7% still met the criteria for ultrasound, according to the

hospital document. Considering all adult patients undergoing ultrasound, only 7.7% did not comply with the instructions in the ED document, the main reason to perform ultrasound in these patients being "isolated nonspecific abdominal pain" (10 patients).

In the case of pediatrics, 15 patients underwent ultrasound examinations, and the reason to perform them was considered appropriate in all cases.^{18,19,20}

The waiting time between the request for the ultrasound examination and its performance was 1 hour and 21 minutes \pm 1 hour and 13 minutes (mean \pm standard deviation) for adult patients and, for pediatric patients, 55 minutes \pm 46 minutes (mean \pm standard deviation). Taking into account only the period from 8pm to 2am the following morning, this waiting time was 1 hour and 1 minute \pm 39 minutes (mean \pm standard deviation), and in the period from 2am to 8am it corresponded to 2 hours and 28 minutes \pm 1 hour and 50 minutes (mean \pm standard deviation). Regarding the time elapsed between the ultrasound examination and 8am the following morning, when the radiologist would start work on a day shift, this corresponded to 7 hours and 31 minutes \pm 3 hours and 24 minutes (mean \pm standard deviation) in adult patients and 8 hours and 23 minutes \pm 1 hour and 50 minutes (mean \pm standard deviation) in pediatric patients. In the period from 8pm to 2am, it was on average 9 hours and 3 minutes \pm 1 hour and 47 minutes (mean \pm standard deviation), and between 2am and 8am, it was 2 hours and 22 minutes \pm 2 hours and 35 minutes (mean \pm standard deviation).

The diagnosis indicated by ultrasound allowed the exclusion of pathology or the possibility of therapeutic management in 275 (91.7%) patients. This group includes 24 of the 30 trauma cases, where eFAST allowed patient orientation without the need for CT, requiring hospitalization for 5 of them, while the remainder were discharged. Also included are cases where ultrasound was the diagnostic method considered the first-line imaging exam, namely in cases of suspected acute scrotum (15),^{22,23} deep vein thrombosis (16)²⁴ and in cases of pathology in pediatric patients (14).^{19,20,21} Of these latter, 5 cases were both pediatric and suspected of scrotal pathology; thus, the total number of patients evaluated solely by ultrasound and in which this imaging method can be considered the gold standard was 40 (13.3%).

The remaining 25 (8.3%) patients, including only 1 pediatric patient, required further study using one or more CT scans, totaling 29 examinations. The distribution of the CT scans performed by anatomical region is described in Fig. 2.

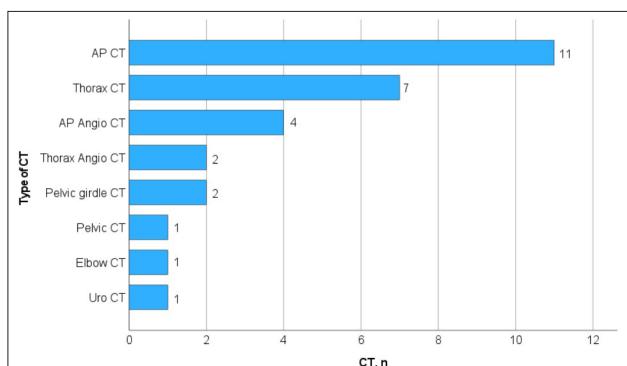


Figure 2 – Distribution of CT scans by anatomical area.
Legend: CT - computed tomography; AP-CT - abdominopelvic computed tomography; Uro-CT - urinary tract computed tomography.

Orientation provided by the ultrasound examination, as well as the final patient orientation, are explained in detail in Table 1.

Final diagnosis given to the patient in the emergency episode can be found in Table 2, as well as its more detailed version, available in the appendix.

Table 1 – Orientation after ultrasound examination and final orientation of patients.

Orientation after ultrasound	Number of patients
CT	25
Discharge	199
Referral to outpatient visit	11
Hospitalization	71
Transfer to another hospital	4
Home hospitalization	1
Final Orientation	Number of patients
High	205
Referral to outpatient visit	11
Hospitalization	87
Transfer to another hospital	7
Home hospitalization	1

Legend: CT - computed tomography

Table 2 – Final diagnosis of patients, based on the ICD-10-CM/PCS code assigned in the ED episode.

Diagnosis	Number of patients
Disease (NOS)	132
Genitourinary	77
Gastrointestinal	36
Osteoarticular	22
Cardiovascular	9
Pulmonary	4
Other	20

Fifteen patients were readmitted to the ED, representing 7.5% of the patients discharged requiring no imaging exam besides the ultrasound. None of these patients can be considered to have had a misdiagnosis on their first visit to the ED, as the ultrasound exams performed upon readmission showed findings overlapping those obtained on first admission.

Discussion

The main objective of this study was to understand the role of ultrasound examinations performed in the Emergency Department during the night shift at our tertiary center. The sample analyzed showed that in most patients requiring imaging assistance, ultrasound proved to be an adequate resource for diagnostic assistance and case management, particularly in 91.7% of patients.

The adult patients included in this study had to wait on average 1 hour and 21 minutes for the requested ultrasound to be performed, a factor that contributed to the increased length of their stay in the ED. Contrary to expectations, the average waiting time for the ultrasound was longer between 2am and 8am (2 hours and 28 minutes), when only emergency ultrasounds were recommended, compared to the period between 8pm and 2am (1 hour and 1 minute). This result can be partly explained by the high percentage of ultrasounds without an emergency indication performed

between 2am and 8am (62.7%), as a large number of these were performed just a few minutes after 2am. They may represent an extension of the work that the radiologist had been performing since 8pm, prolonging the evaluation of non-necessarily emergency cases beyond 2am. In the case of pediatric patients, they had to wait an average of 55 minutes to have the ultrasound, and this waiting time included 45 minutes the radiologist required to arrive at the ED, while on standby.¹²

Therefore, performing additional laboratory or imaging tests is associated with an increase in the length of patient stay in the ED before discharge or admission.^{25,26} However, the long waiting time between the exam and 8am the following morning, when the daytime radiologist would be on duty, highlights the importance of the radiologist being physically present during the night shift: it prevents longer waiting times and speeds up patient counseling during the early morning hours, which helps reduce overcrowding in the ED. If the radiologist were not present, considering the night shift as a whole, patients would have to wait an average of 7 hours and 31 minutes for an ultrasound, including cases (13.3%) in which ultrasound is the first-line exam. If CT were to be performed, reported in teleradiology, this waiting time would not be as long. However, in this case, it would be necessary to consider the risks of this imaging method, namely exposure to ionizing radiation and potential adverse reactions to the contrast agent used in the case of contrast-enhanced CT scans, which were successfully avoided here. Furthermore, it could delay CT in patients with a more robust or urgent indication for this exam.

The use of eFAST in the emergency room for trauma management allows for rapid, noninvasive patient management, potentially altering the initial plan, obviating the need for CT.²⁷ It does not exclude CT in all cases, as our study results illustrate. However, only 6 of these patients required CT, allowing eFAST to advise the remaining 24. Twenty-nine CT scans were performed on 25 patients who had undergone ultrasound prior to the CT scan, a relatively small number for the time period analyzed. Having a radiologist present during the acquisition of these images offers several advantages, including the ability to adapt the exam immediately after viewing suspicious findings that benefit from contrast administration for better characterization. This prevents the patient from having to return to the imaging department later on and undergo ionizing radiation again to complete the study. Furthermore, the physical presence of the radiologist makes it possible to have a direct dialogue with the patient and also with the requesting professional in the ED, both in determining the most appropriate imaging technique and in discussing the results, promoting greater integration of care.²⁸ This discussion assumes even greater importance in the case of imaging findings that support a diagnosis that requires urgent management, since the radiologist can quickly inform the requesting professional, even before the report is completed, a practice commonly referred to as “wet reads”,²⁹ and which would hardly be possible in the context of teleradiology.

The low number of readmissions (7.5%) observed in patients who only underwent ultrasound evaluation, considering a relatively long period after discharge, and on whom no diagnostic failure was observed on the first admission, demonstrates the effectiveness of ultrasound. However, the number of readmissions may be underestimated, as patients may have sought and/or undergone examinations at a healthcare institution other than our center, or may have died

during the time period considered for readmission, aspects not considered in this analysis.

Through the analysis performed, it was possible to determine that 278 patients (92.7%) had a valid reason to undergo ultrasound examination according to hospital guidelines and as described in the literature, in the case of pediatric patients. Even so, there is room for improvement, highlighting the role of the radiologist in assessing the adequacy of the requested examinations, seeking to participate and contribute to the patient's investigation plan, particularly with their specific knowledge in imaging diagnosis.¹⁴ These 278 patients include the 25 cases of patients who, after undergoing ultrasound, required CT for better characterization and diagnosis of the condition. Thus, it is estimated that a considerable number of CT scans were avoided, which would have been performed on many of these patients if teleradiology had only been available during the night. This considerable number of CT scans that were avoided, combined with the fact that most patients were advised solely based on the ultrasound, supports the importance of access to ultrasound examinations during the night period in the ED, allowing the best care to be offered to patients in light of current scientific evidence, namely by minimizing exposure to ionizing radiation and the associated risks.

Although these variables were not evaluated in the study, the radiologist's physical presence also allows for examinations, particularly ultrasounds, to be performed on hospitalized patients who cannot travel to the imaging department, such as intensive care patients, unstable patients or patients undergoing isolation measures. This is, therefore, a variable to consider in future studies focusing this topic.

This study has limitations, some of which have already been mentioned above. The fact that it analyzed a period encompassing only 17 days in November 2023 constitutes another limitation. It would be interesting to analyze a longer period of time to obtain a more reliable extrapolation of the results obtained to the actual day-to-day operations of this tertiary center. There was a lack of information recorded in the SClínico regarding the reason for transferring patients

from other hospitals to this institution. Most cases did not have any information recorded to justify their transfer, and only in one case, out of a total of 31 patients in this situation, was it possible to determine that the transfer was explicitly due to the need for an ultrasound examination, which the referring hospital did not offer during the night shift. In terms of the diagnostic coding available in the emergency episode, an overuse of the term "Disease, NOS" was noted since in a significant percentage of cases, the diagnosis was explicitly stated in the SClínico record, but was not subsequently coded in the appropriate location using ICD-10-CM/PCS terms. This issue was particularly observed in the context of patients seen by the General Surgery specialty, which may have led to an underestimation of some final diagnoses, notably the diagnosis of "acute pancreatitis." Given that, at our institution, there is no period without nocturnal ultrasound examinations for comparison, it is not possible to attempt to "quantify" the reduction in teleradiology examinations.

Conclusion

This study concluded that 91.7% of patients who visited the Emergency Department of this tertiary institution during the night shift received appropriate imaging orientation using ultrasound examinations, and that only 29 CT scans were required during the period under analysis, including patients who previously underwent ultrasound. The low readmission rate (7.5%), with no diagnostic errors, reinforces the effectiveness of ultrasound.

Although not quantifiable, we believe that the ability to perform ultrasound examinations in the Emergency Department during the night shift has avoided a significant number of CT scans.

Therefore, we conclude that having a radiologist on duty during the night shift and access to ultrasound examinations during the same period provide added value to the ED. Reducing unnecessary risks to patients and streamlining patient orientation, while minimizing waiting times, are factors that contribute to better care delivery in the ED.

Divulgações Éticas / Ethical Disclosures

Conflitos de interesse: Os autores declaram não possuir conflitos de interesse.

Conflicts of interest: The authors have no conflicts of interest to declare.

Suporte financeiro: O presente trabalho não foi suportado por nenhum subsídio ou bolsa.

Financing Support: This work has not received any contribution, grant or scholarship.

Confidencialidade dos dados: Os autores declaram ter seguido os protocolos do seu centro de trabalho acerca da publicação dos dados de doentes.

Confidentiality of data: The authors declare that they have followed the protocols of their work center on the publication of data from patients.

Proteção de pessoas e animais: Os autores declaram que os procedimentos seguidos estavam de acordo com os regulamentos estabelecidos pelos responsáveis da Comissão de Investigação Clínica e Ética e de acordo com a Declaração de Helsínquia da Associação Médica Mundial.

Protection of human and animal subjects: The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Originalidade: Este manuscrito é um trabalho original e não foi publicado anteriormente nem está sob consideração por outra revista. Em março de 2025 será alvo de apresentação no âmbito das provas de defesa da tese de mestrado de Sara Gama, no Mestrado Integrado em Medicina, da Faculdade de Medicina da Universidade de Coimbra.

Originality: This manuscript is original and has not been previously published nor is it under consideration by another journal. It will be presented in March 2025 as part of Sara Gama's master's thesis defense for the Integrated Master's in Medicine program at the Faculty of Medicine, University of Coimbra.

Considerações éticas: Este estudo foi aprovado pela Comissão de Ética da Unidade Local de Saúde de Coimbra e pela Comissão de Ética da Faculdade de Medicina da Universidade de Coimbra.

Ethical considerations: This study was approved by the Ethics Committee of the Coimbra Local Health Unit and by the Ethics Committee of the Faculty of Medicine, University of Coimbra.

Referências

1. Serviço Nacional de Saúde. SDM, Módulo de monitorização diária da urgência, ACSS (atualização diária). [Acedido a 16 de novembro de 2024] Disponível em: <https://www.sns.gov.pt/monitorizacao-do-sns/servicos-de-urgencia/>
2. Health at a Glance 2023 [Internet]. OECD; 2023. (Health at a Glance). [Acedido a 16 de novembro de 2024] Disponível em: https://www.oecd.org/en/publications/health-at-a-glance-2023_7a7afb35-en.html
3. Kwee RM, Toxopeus R, Kwee TC. Imaging overuse in the emergency department: the view of radiologists and emergency physicians. European Journal of Radiology. 2024 Jul 1;176.
4. Cao CF, Ma KL, Shan H, Liu TF, Zhao SQ, Wan Y, et al. CT scans and cancer risks: a systematic review and dose-response meta-analysis. BMC Cancer. 2022 Dec 1;22.
5. Ratib O, Adam EJ, Akata D, Alberich-Bayarri A, Dion E, Kahn C, et al. ESR teleradiology survey: results. Insights into Imaging. 2016 Aug 1;7:463-79.
6. Junca-Laplace-Valageas C, Gervaise A, Pernin M, Naulet P, Portron Y, Lapierre-Combes M. Addressing requests for emergency ultrasonographic examinations when implementing teleradiology services. Diagnostic and Interventional Imaging. 2015 Nov 1;96:1141-6.

7. Direção-Geral da Saúde. Norma nº 005/2015 (Telerradiologia). [Acedido a 17 de novembro de 2024] Disponível em: <https://normas.dgs.min-saude.pt/2015/03/25/telerradiologia/>

8. Ordem dos Médicos - Colégios de Radiologia e Neurorradiologia. Manual de Boas Práticas em Telerradiologia (2014). [Acedido a 17 de novembro de 2024] Disponível em: https://ordemdosmedicos.pt/files/pdfs/jD6N-Telerradiologia_Rad_NRadmx_versao_final_2013_-1.pdf

9. Donato P. Radiology in the emergency department. Acta Radiológica Portuguesa; 2022;34:3-4.

10. Martins R, Raimundo P, Alves P, Monteiro R, Silva LD, Gomes A, et al. Adequação dos exames de radiologia solicitados por um departamento de emergência: um estudo retrospectivo. Acta Médica Portuguesa. 2020; 33:7-14.

11. Regulamento da Constituição das Equipas Médicas nos Serviços de Urgência. Regulamento n.º 1029-A/2022, de 24 de outubro.

12. Regime jurídico de dedicação plena no Serviço Nacional de Saúde e da organização e do funcionamento das unidades de saúde familiar. Decreto-Lei nº 103/2023, Artigo 13.º.

13. Silva CF, Guerra T. Volume ou valor? O papel do radiologista na gestão dos exames radiológicos. Acta Médica Portuguesa, 2017;30:628-32.

14. Ordem dos Médicos - Colégios de Radiologia. Manual de Boas Práticas da Especialidade de Radiologia (2024). [Acedido a 18 de novembro de 2024] Disponível em: https://ordemdosmedicos.pt/files/pdfs/rnVB-mbp-radiologia-2024-com_data-e-formatado.pdf

15. Chetlen AL, Chan TL, Ballard DH, et al. Addressing burnout in radiologists. Acad Radiol. 2019;26:526-33.

16. Azeredo TRM, Guedes HM, Rebelo de Almeida RA, Chianca TCM, Martins JCA. Efficacy of the manchester triage system: a systematic review. International Emergency Nursing. 2015;23:47-52.

17. Recomendações sobre realização de ecografia no Serviço de Urgência. Documento da ULS de Coimbra. Disponível em <http://bit.ly/476gzUj>.

18. Administração Central do Sistema de Saúde (ACSS, IP) - Cuidados de Saúde Hospitalares, Codificação Clínica. [Acedido a 10 de dezembro de 2024] Disponível em: https://www.acss.min-saude.pt/category/cuidados-de-saude/hospitalares/#tab_portal-da-codificacao-3

19. Roberts K, Moore H, Raju M, Gent R, Piotto L, Tarhanath A, et al. Diagnostic ultrasound for acute appendicitis: the gold standard. Journal of Pediatric Surgery. 2024 Feb 1;59:235-9.

20. Laine JC, Denning JR, Riccio AI, Jo C, Joglar JM, Wimberly RL. The use of ultrasound in the management of septic arthritis of the hip. Journal of Pediatric Orthopaedics Part B. 2015 Mar 6;24:95-8.

21. Bujons A, Burgu B, Castagnetti M, Pakkasaarvi N, Quaedackers J, Rawashdeh Y, et al. EAU guidelines on paediatric urology. European Association of Urology, 2024.

22. Kitrey ND, Campos-Juanatey F, Hallscheidt P, Mayer E, Serafetinidis E, Sharma DM, et al. EAU Guidelines on Urological Trauma. 2024.

23. Wright S, Hoffmann B. Emergency ultrasound of acute scrotal pain. European Journal of Emergency Medicine. Lippincott Williams and Wilkins; 2015;22:2-9.

24. Kakkos SK, Gohel M, Baekgaard N, Bauersachs R, Bellmunt-Montoya S, Black SA, et al. Editor's Choice – European Society for Vascular Surgery (ESVS) 2021 clinical practice guidelines on the management of venous thrombosis. European Journal of Vascular and Endovascular Surgery. 2021 Jan 1;61:9-82.

25. Kawano T, Nishiyama K, Hayashi H. Execution of diagnostic testing has a stronger effect on emergency department crowding than other common factors: A cross-sectional study. PLOS ONE. 2014 Oct 13;9:e108447.

26. Kocher KE, Meurer WJ, Desmond JS, Nallamothu BK. Effect of testing and treatment on emergency department length of stay using a national database. Academic Emergency Medicine. 2012 May;19:525-34.

27. Ollerton JE, Sugrue M, Balogh Z, D'Amours SK, Giles A, Wyllie P. Prospective study to evaluate the influence of FAST on trauma patient management. Journal of Trauma - Injury, Infection and Critical Care. 2006 Apr;60:785-91.

28. Shuaib W, Johnson JO, Khosa F. Role of emergency radiology in patient care: Educating medical students and new trainees in emergency medicine. Vol. 11, Journal of the American College of Radiology. 2014;11:731-2.

29. Wang DC, Parry CR, Feldman M, Tomlinson G, Sarrazin J, Glanc P. Acute abdomen in the emergency department: Is CT a time-limiting factor? American Journal of Roentgenology. 2015 Dec 1;205:1222-9.

Annex – Final diagnosis of patients, based on the ICD-10-CM/PCS code assigned in the ED episode.

Diagnosis	Number of patients
Disease (NOS)	132
Genitourinary	77
Acute pyelonephritis	20
Renal colic	17
Cystitis	14
Epididymo-orchitis	6
Testicular pain	4
Hematuria	3
Urinary tract infection (UTI)	3
Renal failure	2
Acute prostatitis	2
Kidney transplant complication	1
Urinary retention	1
Testicular torsion	1
Testicular neoplasm	1
Hydrocele	1
Salpingitis	1
Gastrointestinal	36
Gastroenteritis and colitis	6
Acute pancreatitis	6
Abdominal pain	5
Cholestone disease	4
Liver cirrhosis	3
Constipation	2
Acute abdomen	2
Ulcerative colitis	1
Acute appendicitis	1
Duodenal ulcer with perforation	1
Gastritis	1
Ogilvie syndrome	1
Acute viral hepatitis	1
Cholangitis	1
Fatty liver	1
Osteoarticular	22
Biomechanical Injury	7
Low Back Pain	7
Fracture	4
Septic Arthritis	2
Acute Osteomyelitis	1
Leg Injury	1
Cardiovascular	9
Thrombophlebitis	2
Localized edema	2
Heart failure	1
Hypertension (primary)	1
Deep vein thrombosis	1
Pulmonary thromboembolism	1
Lymphedema	1
Pulmonary	4
Pleural effusion	2
Bacterial pneumonia	2
Other	20
Fall	3
Fever	2
Sepsis	2
Thyroid Disorder	1
Lower Limb Cellulitis	1
Breast Implant Complication	1
Chronic Pain	1
Elevated LDH	1
Subdural hemorrhage	1
Hyperkalemia	1
Nephrostomy catheter infection	1
Lymphoid leukemia	1
Acute myeloid leukemia	1
Malaria	1
Parotitis	1
Tumor lysis syndrome	1

Legend: NOS - not otherwise specified; NS - not specified; LDH - lactate dehydrogenase.