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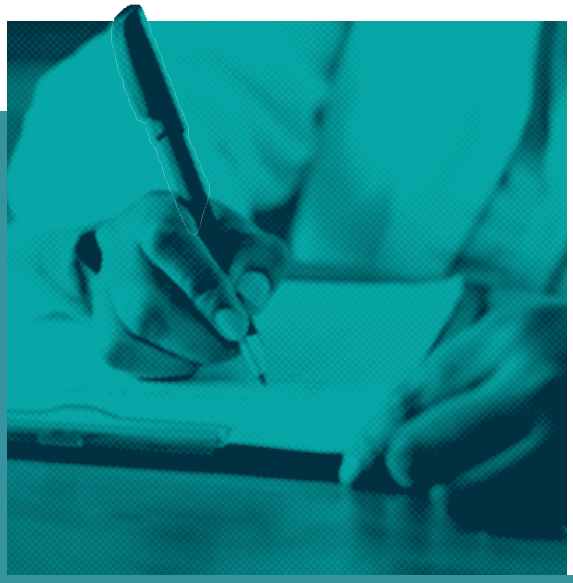

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EDITORIAL

Molecular Medicine: Bridging Discovery and Clinical Transformation

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Molecular medicine has rapidly evolved from a conceptual framework to a transformative discipline at the intersection of molecular biology and clinical practice. Rooted in the discovery of DNA's structure in 1953 and empowered by methodological breakthroughs such as recombinant DNA technology, the polymerase chain reaction, and more recently next-generation sequencing and CRISPR/Cas9 technology, this field has redefined how we understand, diagnose, treat, and prevent diseases.

In its early phases, molecular medicine focused on characterizing the molecular basis of disease, revealing how mutations in genes such as *TP53* and *BRCA1/2* disrupt cellular regulation and drive oncogenesis. Similar progress in neurology identified mutations in the *APOE* and *APP* genes as pivotal in Alzheimer's disease, and the *HTT* gene in Huntington's disease. These insights established the paradigm that many diseases originate in molecular derangements that can be precisely mapped in our genome.

Today, the field is defined by unprecedented technological sophistication. Next-generation sequencing enables comprehensive genomic and transcriptomic profiling, while single-cell and spatial transcriptomics deepen our understanding of cellular heterogeneity in both health and pathology. CRISPR-Cas9 genome editing now provides a platform for correcting pathogenic mutations and advancing gene-based therapies.

The clinical translation of these discoveries has been equally transformative. Personalized medicine, informed by genomic profiling, is now a cornerstone of oncology and increasingly of cardiovascular and neurological care. Targeted therapies such as imatinib for *BCR-ABL*–positive chronic myeloid leukaemia and trastuzumab for *HER2*-positive breast cancer exemplify the power of molecularly guided intervention. Furthermore, the advent of liquid biopsy technologies allows real-time monitoring of circulating tumour DNA, offering new avenues for early detection and therapeutic adaptation.

> *"The future of molecular medicine will depend on coupling technical innovation with equitable implementation"*

Yet challenges remain. Integrating multi-omics data into clinically actionable insights requires robust computational tools, and the ethical dimensions of genome editing and data privacy demand ongoing scrutiny. The future of molecular medicine will depend on coupling technical innovation with equitable implementation. Artificial intelligence and machine learning promise to synthesize molecular data into useful information for healthcare and to construct predictive models of disease, but they must be used responsibly.

Molecular medicine is no longer an emerging field—it is a defining force in modern healthcare, as demonstrated during the recent SARS-CoV-2 pandemic, where an impressive collaborative effort of scientists and physicians working together to understand the epidemiology and pathology of COVID-19 led to the development of a new class of vaccines at unprecedented speed, allowing control of the crisis.

Its trajectory demonstrates how discovery science can reshape clinical practice, transforming medicine from reactive care to proactive, precise, and preventative intervention. As we look forward, the imperative is clear: to ensure that the transformative potential of molecular medicine is translated into accessible benefits for all patients, not just a privileged few.

“Molecular medicine is no longer an emerging field—it is a defining force in modern healthcare…”

Teresa Carvalho
Member of the Editorial Board (JSCMed)

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JORNAL DA SOCIEDADE DAS CIÊNCIAS MÉDICAS DE LISBOA

LETTER TO THE EDITOR

Posture, motion and therapeutic relationship: Physiotherapy and Philosophy

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KEYWORDS: Posture, Movement, Therapeutic relationship, Physiotherapy, Philosophy

The heraclitean duality of "Posture vs. Movement" emerges from the Body to show us how paradoxical the relationship it establishes with Philosophy itself, as well as with Epistemology. But this polarity has an interesting parallel with what the theme of "Postural Reeducation" conveys to us as an epistemic movement "ad infinitum".

The fact that movement emerges from posture, and that posture allows movement, does not prevent an inadequate understanding of how the muscles of the posterior region of the body work. Organized as a "muscular chain" (which should be better called "neuromyofascial chain"), they require a minimum muscle length, adequate stretching, to support the work of the anterior, "liberal" muscles 1-3 Strengthening the posterior muscles, when excessively "tonic," has the effect of fueling hegemonies, making movement difficult, which, in turn, implies more contraction (anterior and posterior). And yet, hegemony also translates into an excess of the intrinsic re-educative method, the invitation to helpful stretching, which also results in contraction, in defense. And this manifests itself "positively" in the empirical symptom, in pain 4.

The body's areas evoke the therapeutic relationship. A balanced stretch invites a "therapist vs. patient" depolarization; excessive dogma distracts from this relationship, empirically polarizing it. From a monistic equilibrium, we devolve into a "Subject-Object" dualism. The Subject/therapist produces another Subject, the former patient, and this dualizes (itself) into the former therapist. Tension increases the imbalance, the "pathos". Each pole will strive

The paradox is that there are two faces: "Determination" and "Freedom", "Reason" and "empiricism", "Spirit" and "matter", "Subject" and "Object", "Posture" and "movement", and the inability to unite what time continually recreates in the game of illusion, of existence, which is being in the body, a monistic "duel".

to attract the "dual" elements of the System, conquering Reality, attempting a new Reason-Reality relationship. Defensive polarization attempts depolarization through a "rational" conquest of the System, and this is an attempt at phenomenal pacification. The more scientific relationship, the one with the greatest support from the real "a priori", will perhaps win, but any gain will defeat the entire System, because the defense is appeased.

Absolute balance would kill Subject and Object; it is the logic of life that reason composes the approximation, but simultaneously prevents fusion. The state of "incompetence" portrays the "normal" duality of Reality, the necessary, obligatory distancing from rational objectivity. The Object kills reason, Ethics kills morality. A compensation brings closer; if it is plausible, it increases the likelihood of being unbalanced by physicalist Reality. If, however, the dominant Reality can be constructed, this implies that the "a priori" Truth does not necessarily have the final word, and also implies that the "eternal return" can occur, and only tolerance can depolarize, bringing them closer to impassivity. The Object, Truth (unbearable and improbable, of course), kills the relationship of lovers with Love. Not without the risk of mortal polarization due to fear of fusion.

A tolerant stance grows in stature and better resists adversity; it fosters depolarization, pacifying, and diluting "pathos". This is created by threat; it is here that movement becomes "tense" and equilibrium falters. Tension creates compensations, and these mimic the childish stance/reason, just as "pathos", movement, is a threat to equilibrium. Defense seeks to recreate Unity, but this is thwarted by desire, just as "free will" impedes indeterminacy, Freedom, which is a matter of destiny.

The paradox is that there are two faces: "Determination" and "Freedom", "Reason" and "empiricism", "Spirit" and "matter", "Subject" and "Object", "Posture" and "movement", and the inability to unite what time continually recreates in the game of illusion, of existence, which is being in the body, a monistic "duel". But to see, to prove, we must die; we are condemned to not fully be, and this is the condition of an ever-provisional science, and the only dogma is movement. And it is from this that the dogma of pseudoscience is nourished, which seeks in circularity the foundation of necessary contradiction, when science, in its "reduction" tries to secure doubt. Placebetarian pseudoscience seems like a misstep, but the paradox is knowing that future science can come from it, but this too can be a "misstep", an unbalanced movement. The greatest hygiene is the balance that is generated spontaneously, and this can never be a matter of "life or death."

REFERENCES

1. **Mézières F.** La révolution en gymnastique orthopédique. Paris: Vuibert; 1949.
2. **Souchard Ph-E.** Le champs clos. Paris: Maloine; 1981.
3. **Coelho L.** O anti-fitness ou o manifesto anti-desportivo. Introdução ao conceito de reeducação postural. Quinta do Conde: Contra-Margem, 2008.
4. **Coelho L.** A dor da fisioterapia (e filosofia). Revista Dor da APED. 2021;28(2):91-93. doi: 10.24875/DOR.M21000010.

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VIEWPOINT

Large Language Models in Medicine

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KEYWORDS: Large Language Models; Artificial Intelligence; Clinical Applications; Ethics and Regulation; Medical Education

Introduction

The application of artificial intelligence (AI) to medicine is not new, but the advancement of Large Language Models [LLMs], such as GPT-5 and other emerging multimodal models, represents a qualitative forward shift. These models have already moved beyond the experimental domain and are beginning to integrate into everyday clinical tasks, from supporting the writing of notes and reports, to triaging patient messages and synthesizing scientific literature [1,2].

The apparent benefits are important: increased efficiency, reduced administrative overhead, rapid access to information, interviewing patients and even support for diagnostic reasoning. However, the transition from enthusiasm to responsible adoption requires a new level of rigor: less technological fascination and more scientific maturity. In practice, the question has shifted from "can the LLM do this?" to "should it do it, and under what conditions?"

In this article we discuss some aspects of the role of LLMs in medicine. The potential applications of this technology are immense, but for this paper we selected some of the most relevant and well studied. We have included a glossary at the end, with some useful definitions.

Where LLMs already demonstrate value

Clinical Documentation and Summarization: Several studies have shown that models adapted to the medical context can outperform human experts in writing and summarizing clinical notes when supervised [3]. There is evidence that LLM trained with real clinical data produced summaries superior to those of physicians in terms of accuracy and completeness, saving significant administrative time [1]. These results point to a concrete opportunity: reducing bureaucratic burden and returning time to direct care.

Patient Communication: Models like ChatGPT have been tested in the context of responding to patient messages. In a study from JAMA Internal Medicine (2023), AI-generated responses were rated by an independent panel as more empathetic and detailed than those of physicians [4]. However, the same study emphasizes that AI should not replace the practitioner, but rather serve as a co-pilot, preparing drafts that the clinician reviews and validates.

Medical Education and Health Literacy: LLMs have demonstrated remarkable performance on standardized USMLE exams and other medical tests [5,6]. While these results demonstrate high performance and knowledge, they fail to capture contextual clini-

cal reasoning. In practice, the LLM can be useful as an educational tool (synthesizing information, explaining concepts, and generating clinical cases) but it still does not replace human clinical judgment.

Limitations and Risks

Despite advances, LLMs have serious limitations that cannot be ignored.

Hallucinations and Factual Errors: The phenomenon of hallucination (the generation of incorrect but plausible information) is perhaps the greatest clinical risk. Even recent models continue to produce false statements with high confidence, which can induce clinical error if the user blindly trusts the output [7].

Bias and Fairness: LLMs reproduce (and sometimes amplify) the biases present in the data they were trained on. This can translate into disparities in response quality by ethnic group, gender, language, or socioeconomic status [8]. Stratified performance testing and continuous adjustments are essential to ensure fairness.

Lack of Transparency and Traceability: The most powerful language models are often closed-source, making thorough audits impossible and error correction difficult. This opacity is incompatible with the principle of traceability that governs medical technologies. The scientific community has called for the adoption of open-source, auditable models for clinical use, with detailed documentation ("model cards") [9].

Transferability and Context: The performance of a model trained in one language or in one healthcare system can degrade substantially in other contexts. Local adaptation, via fine-tuning or contextual prompt engineering, is necessary to avoid cultural and clinical errors [10].

Ethics, Safety, and Regulation

In 2024, the World Health Organization [WHO] published the first ethical and governance guide for large-scale [multi]modal models in healthcare, with more than 40 recommendations [11]. These include: Independent prior evaluation of performance and safety; Post-deployment monitoring; Transparency of training data and limitations; Mandatory human oversight in critical decisions; Protection of personal data and informed consent.

In the US, the FDA updated its guidelines for software with AI/ML functions, integrating LLMs into the Software as a Medical Device [SaMD] category [12]. At the European level, the AI Act (2024) classifies medical AI as "high risk," requiring technical documentation, lifecycle management, explainability, and CE certification before commercialization [13].

Concurrently, the debate over legal liability is growing. If a clinical decision results from an interaction between a human and AI, who is liable in the event of harm? Recent literature advocates for clear institutional contracts and automatic records of AI-assisted decisions, ensuring shared accountability [14].

From Algorithmic Evidence to Clinical Evidence

Research on LLMs has been dominated by algorithmic metrics: accuracy, BLEU scores, F1 scores, pass rates. However, clinical utility requires another type of proof: real impact on health outcomes, efficiency, and safety. Pragmatic studies in hospital settings are still scarce. In 2024, the NEJM AI emphasized that "transition to clinical practice requires demonstrating direct benefit to patients, not just computational performance" [15].

Furthermore, equity assessment should become mandatory. LLM performance should be tested by age, gender, language, and socioeconomic status, and published, just as demographic composition is published in clinical trials. In the Table I we suggest operational recommendations for responsible implementation of LLMs in clinical settings.

The Near Future: Multimodality and Integration

The next step for LLMs in medicine is multimodality: models capable of processing text, images, audio, and structured data simultaneously. This will enable joint interpretations of reports, exams, and clinical examinations. One should be alert that each new type of data introduces new privacy risks and validation complexities [16].

Simultaneously, LLMs are being integrated into electronic health records [EHRs], facilitating information querying, automated note-writing, and interdisciplinary communication. These applications promise

TABLE I. Operational recommendations for responsible implementation of LLMs in clinical settings.

FASE	RECOMMENDED ACTION	OBJECTIVE
1 Usage selection	Choose low-risk/high-volume tasks (e.g., drafting notes, administrative responses)	Minimize risk and maximize impact
2 Prior assessment	DPIA (personal data impact assessment, legal opinion, and ethical analysis)	Legal and ethical compliance
3 Local adaptation	Light fine-tuning with anonymized data or contextual prompt engineering	Clinical and linguistic relevance
4 Independent validation	Testing with clinically meaningful metrics and diverse samples	Reliability and fairness
5 Governance	Documentation ("model cards"), version logs, rollback mechanisms	Transparency and traceability
6 Human oversight	Define the role of the human-in-the-loop per task	Clinical control and safety
7 Continuous monitoring	Periodic audits, performance logs, feedback channels	Continuous improvement
8 User training	AI literacy and training to identify hallucinations and bias	Safe use conscious

substantial efficiency gains but require improved control and explainability mechanisms [17].

Conclusion

Large language models [LLMs] are rapidly transforming medical practice, from administrative tasks to assisted clinical reasoning.

The enthusiasm surrounding these tools is understandable, but their potential benefits will only be realized if they are treated as medical technologies, with appropriate validation, oversight, and regulation. Large language models are not "artificial doctors"; they are (at best) cognitive augmentation tools. Their potential to improve quality, efficiency, and equity in health is real, but it will only be realized if they are treated like any other medical technology: with specifications for use, independent validation, continuous monitoring, and ethical governance.

Clinical adoption of LLMs must be gradual, supervised, and transparent. Each step must be accompanied by documentation, training, and impact assessment. Trust should not come from the model's reputation, but from locally produced evidence.

The challenge in 2025 is to transform fascinating models into reliable clinical tools: patient-centric, auditable, and fair. This requires collaboration between physicians, engineers, regulators, and patients.

We believe that the future of AI in medicine will not depend on the size of the models, but on the maturity of the institutions that use them.

REFERENCES

1. Thirunavukarasu AJ, Ting DSJ, Elangovan A, et al. Large language models in medicine. Nat Med. 2023;29:1930–1940.
2. Riedemann L, et al. The path forward for large language models in medicine is open. NPJ Digit Med. 2024 Nov 27;7(1):339. doi:10.1038/s41746-024-01344-w.
3. Van Veen D, Van Uden C, Blankemeier L, et al. Adapted large language models can outperform medical experts in clinical text summarization. Nat Med. 2024;30:1134–1142. doi:10.1038/s41591-024-02855-5.
4. Ayers JW, Poliak A, Dredze M, et al. Comparing physician and artificial intelligence chatbot responses to patient questions posted to a public social media forum. JAMA Intern Med. 2023;183(6):589–596. doi:10.1001/jamainternmed.2023.1838.
5. Nori H, King N, McKinney SM, Carignan D, Horvitz E. Capabilities of GPT-4 on medical challenge problems. arXiv [cs.CL]. 2023 Apr 12. doi:10.48550/arXiv.2303.13375.
6. Singhal K, Tu T, Gottweis J, et al. Toward expert-level medical question answering with large language models. Nat Med. 2025;31:943–950. doi:10.1038/s41591-024-03423-7.
7. Patel SB, Lam K. ChatGPT: the future of discharge summaries? Lancet Digit Health. 2023 Mar;5(3):e107–e108. doi:10.1016/S2589-7500(23)00021-3. Epub 2023 Feb 6. PMID: 36754724.

8. Li H, Moon JT, Purkayastha S, Celi LA, Trivedi H, Gichoya JW. Ethics of large language models in medicine and medical research. Lancet Digit Health. 2023 Jun;5(6):e333–e335. doi:10.1016/S2589-7500(23)00083-3. Epub 2023 Apr 27. PMID: 37120418.
9. Koller D. Why we support and encourage the use of large language models in NEJM AI submissions. NEJM AI. 2024;1(1). doi:10.1056/AIe2300128.
10. Meng X, Yan X, Zhang K, et al. The application of large language models in medicine: a scoping review. iScience. 2024 Apr 23;27(5):109713. doi:10.1016/j.isci.2024.109713. PMID: 38746668; PMCID: PMC11091685.
11. World Health Organization. Ethics and governance of artificial intelligence for health: guidance on large (multimodal) models. Geneva: WHO; 2024.
12. U.S. Food and Drug Administration. Artificial Intelligence/Machine Learning-Based Software as a Medical Device Action Plan. Silver Spring, MD: FDA; 2021.
13. European Union. Artificial Intelligence Act. Regulation (EU) 2024/1689 of the European Parliament and of the Council. Brussels: EU; 2024.
14. Maliha G, Gerke S, Cohen IG, et al. Artificial intelligence and liability in medicine: balancing safety and innovation. Milbank Q. 2021 Sep;99(3):629–647. doi:10.1111/1468-0009.12504. Epub 2021 Apr 6. PMID: 33822422; PMCID: PMC8452365.
15. McCoy LG, Swamy R, Sagar N, et al. Assessment of large language models in clinical reasoning: a novel benchmarking study. NEJM AI. 2025;2(10). doi:10.1056/AIdbp2500120.
16. Han T, Adams LC, Bressem KK, et al. Comparative analysis of multimodal large language model performance on clinical vignette questions. JAMA. 2024 Apr 16;331(15):1320–1321. doi:10.1001/jama.2023.27861. PMID: 38497956; PMCID: PMC10949144.
17. Widner K, Virmani S, Krause J, et al. Lessons learned from translating AI from development to deployment in healthcare. Nat Med. 2023;29:1304–1306. doi:10.1038/s41591-023-02293-9.
18. Omiye JA, Gui H, Rezaei SJ, Zou J, Daneshjou R. Large Language Models in Medicine: The Potentials and Pitfalls: A Narrative Review. Ann Intern Med. 2024 Feb;177(2):210-220. doi:10.7326/M23-2772. Epub 2024 Jan 30

BRIEF GLOSSARY [18]

DESIGNATION	DEFINITION
Bias (in AI)	*Systematic errors in the output of a model due to flawed assumptions in the machine-learning process. This is usually from the data the model are trained on and can also be accentuated in the fine-tuning process.*
Fine-tuning	*Further training a pretrained model on a specific task and adjusting the preexisting parameters to achieve better performance for a particular task.*
Foundation model	*A large-scale neural network model trained on vast data to develop broad learning capabilities, which can be fine-tuned for specific tasks. A foundation model can be fine-tuned to generate reports or answer medical questions.*
Generative artificial intelligence	*Models trained on large data sets that can produce seemingly novel realistic content. This can be audio, visual, or text.*
Large language models (LLMs)	*AI models trained on an enormous amount of text data, that are capable of generating humanlike text and learning relationships between words.*
Multimodal LLMs	*Models capable of processing and generating different types of data, such as text, images, and audio. They are an emerging form of LLM with a wide range of potential applications in medicine.*
Neural networks	*Systems inspired by the neuronal connections in the brain that are capable of learning, recognizing patterns, and making predictions on tasks without explicit programming. They are the building blocks of many modern machine-learning (deep-learning) algorithms.*
Pretraining	*The initial phase of training a model on a large data set before fine-tuning it on a task-specific data set. The parameters are updated in the training process.*

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ONE LIFE IN MEDICINE

António José de Barros Veloso

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António José de Barros Veloso was born in Coimbra in September 1930, the son of a doctor and a piano teacher. His childhood was marked by a defining event: at eight months of age, his mother contracted pulmonary tuberculosis, leading to her being admitted to the *Sanatório do Caramulo,* causing a separation between him and his mother. This circumstance would decisively influence his personal and professional trajectory.

His father regularly visited his mother at the sanatorium, and this contact resulted in his integration into the institution's clinical staff, where he would pursue his entire career.

After three years of hospitalisation, his mother was discharged, and the family, already living in Caramulo — a small village that grew up around this mountain sanatorium in the centre of Portugal — decided to settle there permanently. It was in this peculiar environment that the young António José grew up, until his studies took him to other places, while maintaining regular visits to his family. His experience there would lead, decades later, to the publication of a book dedicated to his sanatorium experience: *Caramulo: The Rise and Fall of a Tuberculosis Resort.* [1]

Gifted with a multifaceted personality, he balanced medical practice with intense cultural activities. An inspired jazz pianist, he regularly attended and performed at the famous jazz club in Lisbon, the Hot Club, with some of Portugal's most renowned jazz performers.

Barros Veloso delivering his speech at the Doctor Honoris Causa ceremony, Universidade Nova de Lisboa, 2018.

After graduating in Medicine from the University of Coimbra, he was attracted to the prestige of the *Hospitais Civis de Lisboa* and its *Banco* (emergency department). He thus submitted himself to the famously demanding admission examinations, succeeding well. He then progressed through his career as a specialist in Internal Medicine, culminating in the role of Director of a Medicine Department *(Medicina 1)* at the *Hospital de Santo António dos Capuchos.*

As a central figure in the development of Internal Medicine in Portugal, Barros Veloso organised several highly reputable annual courses. He founded the Portuguese Society of Internal Medicine and was the editor of its scientific journal. He was also a founding member of the *European Society of Internal Medicine.*

Gifted with a multifaceted personality, he balanced medical practice with intense cultural activities. An inspired jazz pianist, he regularly attended and performed at the famous jazz club in Lisbon, the *Hot Club,* with some of Portugal's most renowned jazz performers.

He inherited his love of the piano from his mother, a talented interpreter of 19th-century classical works, because, as he stated, they were both blessed with a "musical mind."

After retirement, he devoted himself to studying the History and Philosophy of Science, completing a master's degree at the Faculty of Sciences of the University of Lisbon. This experience resulted in the publication of the book *Tycho Brahe: A Fabulous Astronomer in the Kingdom of Denmark.*[2]

Barros Veloso performing at Távola Jazz Bar, Lisbon, September 2024.

His commitment to the History of Medicine resulted in several publications, including a landmark work: Doctors and Society: For a *History of Medicine in 20th-Century Portugal* [3], of which he is the co-author, coordinator and editor. His cultural interests expanded to the history of tile art — an artistic expression of Arab origin and of excellence in Portugal — which led him, in co-authorship with his wife, Isabel Almasqué, to publish several volumes, notably: *Hospitais Civis de Lisboa – History and Tiles* [4], dedicated to the tile heritage in those hospital buildings, many of which were former convents, some as old as the 15th century, and another entitled *Portuguese Tiles and Art Nouveau*[5], considered a groundbreaking work.

His separation from everyday clinical practice, combined with his longevity, allowed him to develop a critical appreciation of the paths of contemporary medicine, which was expressed in *Medicine and Other Things*[6]. In it, he compares the modern era to a new Renaissance, drawing fundamental parallels such as the invention of the printing press and the emergence of the internet, and between Montaigne's scepticism and current denialism regarding climate change and the supposed harmful effects of vaccines.

In recognition of his remarkable contribution to Portuguese medicine and culture, he was awarded the title of *Doctor Honoris Causa by the Universidade Nova de Lisboa* in 2018, at the age of 88.

António José de Barros Veloso continues to write and participate in jazz jam sessions.

He is an esteemed figure in Portuguese medicine, embodying the ideal of the humanistic and versatile physician, giving full meaning to the aphorism from the nineteenth-century Spanish anatomist José de Letamendi and popularised in Portugal by Abel Salazar: *"The one who only knows about Medicine, does not even know about Medicine."*

REFERENCES

1. Barros Veloso AJ. *Caramulo: ascensão e queda de uma estância de tuberculosos.* Lisboa: By the Book; 2010. ISBN: 9789899640900.
2. Barros Veloso AJ. *Tycho Brahe: um astrónomo fabuloso no Reino da Dinamarca.* Lisboa: By the Book; 2017. ISBN: 9789898614094.
3. Barros Veloso AJ, coord. *Médicos e sociedade: para uma história da medicina em Portugal do século XX.* Lisboa: By the Book; 2017. ISBN: 9789898614568.
4. Barros Veloso AJ, Almasqué I. *Hospitais Civis de Lisboa: história e azulejos.* Lisboa: By the Book; 2016. ISBN: 9789898614384.
5. Barros Veloso AJ, Almasqué I. *Azulejos portugueses e Art Nouveau.* Lisboa: By the Book; 2016. ISBN: 9789728387648.
6. Barros Veloso AJ. *Medicina – a arte e o ofício.* Lisboa: Gradiva; 2000. ISBN: 9789726627555.

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In-Hospital Falls and Fractures: Underreported, Overlooked, and Lethal

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ABSTRACT: Introduction: In-hospital falls are a persistent issue and the most frequently reported adverse event among older patients. Fall rates typically range from 3 to 11 per 1,000 patient-days, with 25–40% causing injury and up to 10% resulting in serious harm. In Portugal, falls account for 21% of all hospital-reported incidents, according to the National Incident Identification System, highlighting the need for effective prevention. **Objectives:** To evaluate the prevalence and severity of in-hospital falls at a tertiary hospital in 2023 and the number of associated fractures. **Methods:** Retrospective observational study of all hospitalized patients who sustained a fall between January and December 2023. Falls were identified through nursing reports and the internal risk management system, then cross-referenced with orthopedic referrals to confirm fractures. For these cases, outcomes such as mortality, length of stay, and discharge destination were assessed. Data were extracted from electronic records and statistically analyzed. **Results:** A total of 277 falls were reported by nurses (0.6 per 1,000 patient-days), but only 126 were recorded in the internal reporting system (RISI), with 5 classified as severe. Eight patients sustained fractures (3% of reported falls), with a median age of 73.5 years; 65% were male. Fractures included 4 proximal femur, 2 humerus, 1 malleolus, and 1 vertebra. Outcomes were severe: 50% in-hospital mortality, 88% mortality at 120 days, median stay of 55 days, and none regained independent living. **Conclusion:** This study reveals not only a likely underreporting of in-hospital falls but also the serious clinical consequences associated with fall-related fractures.

KEYWORDS: In-hospital falls, fractures, incident reporting, fall prevention

INTRODUCTION

The International Quality Indicator Project defines a fall as any unplanned descent of a patient to the floor or to a lower surface, with or without injury to the patient[1,2]. Despite global recognition of the problem, in-hospital falls remain a persistent concern and represent the most commonly reported adverse event among hospitalized older adults[3,4]

Falls and their associated injuries are more prevalent in older populations and can lead to fractures, pain, disability, fear of falling, loss of independence, reduced mobility, premature death, and increased risk of institutionalization. Beyond the direct physical and psychological impact on the patient, falls also have a significant impact on families, society, and health system costs, making this a major global health issue[5,6].

Fall rates in hospitals vary widely across countries but are generally estimated at 3 to 11 falls per 1,000 patient-days. Of these, approximately 25–40% result in physical injuries, and 1–10% lead to serious harm such as fractures - most commonly of the hip, wrist, humerus, and pelvis[3,4,7,8].

In Portugal, data from the national incident reporting system (Notific@) indicate that 21% of all re-

ported incidents are fall-related[9]. Furthermore, a study conducted at Braga Hospital identified patient falls as the most frequently reported incident[2].

Summaries of the evidence highlight several risk factors for falls among hospitalized patients, including gait instability, delirium, cognitive impairment, urinary incontinence, history of previous falls, visual impairment, multimorbidity, and the use of psychotropic medications[9]. The National Initiative for the Care of the Elderly (NICE) also identifies pain, polypharmacy, and muscle weakness as additional contributors[4].

Falls in hospital settings are widely recognized as an indicator of care quality and are associated with longer hospital stays and poorer patient outcomes. Severe injuries — mostly orthopedic — have a devastating impact on the patient's quality of life[2,3].

Given the frequency and potential severity of in-hospital falls and related fractures, this issue demands urgent and effective preventive strategies[9].

This study aimed to assess the prevalence and severity of in-hospital falls in 2023, characterize patients who sustained fall-related fractures, and compare falls recorded by the nursing team with those officially reported in the Internal Risk Management System (RISI).

METHODS

Retrospective observational study that analyzed the number of fractures associated with falls among inpatients at Unidade Local de Saude Santa Maria (ULSSM) during the year 2023. The target population consisted of all hospitalized patients who sustained an in-hospital fall between January and December 2023.

1. Population and Data collection

The study included all hospitalized patients aged 18 years or older who sustained fractures resulting from falls that occurred within the hospital setting between January 1 and December 31, 2023.

In-hospital falls was identified through nursing incident reports and the internal risk management system (RISI). Falls reported in the RISI were classified according to their severity using the International Classification for Patient Safety (ICPS), while those reported by nursing staff were categorized by location: inpatient units or outpatient areas, including outpatients clinics, imaging, radiotherapy, hemodialysis, and the emergency department.

Data from the nursing reports and RISI were anonymized, preventing individual patient identification. These sources were cross-referenced with the orthopedic referral system to identify cases of suspected or confirmed fractures.

Additional data were obtained through the orthopedic referral system and the electronic medical record (EMR). These sources allowed for patient identification and enabled a more detailed clinical and demographic characterization, including diagnoses, treatments, and outcomes. The referral system was specifically used to identify all fracture cases resulting from in-hospital falls during 2023.

2. Variables

The variables analyzed in this study encompassed demographic, clinical, functional, and contextual data. Demographic variables included age and sex. Hospital-related variables comprised the date of admission, date of fracture, and total length of hospital stay , including the circumstances of the fall and the use of physical restraints. These data were used to calculate the fall risk at admission based on the Downtown scale.

Pre-fracture status was assessed through the patient's place of residence prior to the fall. Fracture-specific characteristics included the side affected, the presence of pathological fracture, and whether surgical intervention was performed.

Post-fracture data included in-hospital mortality, discharge date, and discharge destination. Functional and nutritional assessments performed at admission were also collected, including the Clinical Frailty Scale (CFS), the Eastern Cooperative Oncology Group (ECOG) performance status, and nutritional status.

Vital status was assessed at 30, 120 days and 1 year post-fracture to determine short- and medium-term and long-term outcomes. Risk factors for falls were assessed using the Downton Fall Risk Index and included the use of tranquilizers, sedatives, psychotropic drugs, antihypertensives, antidepressants, and antiparkinsonian medications; a documented history of previous falls; visual and hearing impairments; a confused mental state; and gait instability.

Risk factors for fractures were also documented based on the FRAX® tool, including a history of previous fractures, current smoking, use of glucocorticoids, diagnosis of rheumatoid arthritis, presence of secondary osteoporosis, and alcohol consumption of three or more units per day.

In the context of the conceptual framework

of the International Classification for Patient Safety (ICPS), the variable "Degree of Harm" was categorized as follows: **None,** when the consequence for the patient was asymptomatic or without detectable symptoms and required no treatment; **Mild,** when the consequence was symptomatic, involving mild symptoms, temporary loss of function, or minimal to moderate short-term harm, requiring no intervention or only minimal intervention, such as additional observation, investigation, analysis, or minor treatment; **Moderate,** when the patient was symptomatic and required further intervention—such as an additional procedure or therapy—an extended hospital stay, or experienced permanent or long-term harm or loss of function; **Severe,** when the consequence was symptomatic and necessitated life- saving measures or major medical/ surgical intervention, led to a reduction in life expectancy, or caused significant permanent or long-term harm or functional loss; and **Death,** when, on the balance of probabilities, the incident was the direct or contributing cause of death or significantly hastened death in the short term [10].

4. Ethics and confidentiality

The study was approved by the Ethics Committee of CAML (Centro Académico de Medicina de Lisboa) – ref 295/24. All procedures were conducted in accordance with the ethical standards of the institutional research committee and with the principles outlined in the Declaration of Helsinki. Given the nature of the study and the use of anonymized data from electronic health records, the requirement for informed consent was waived by the ethics committee.

5. Data analysis

Data was organized and analyzed using statistical software. Data analysis was conducted using descriptive statistics, including the mean with standard deviation (SD), median with interquartile range (IQR) and frequencies, as appropriate to characterise the sample.

RESULTS

Prevalence of falls

In 2023, a total of 277 in-hospital falls were reported by the nursing team; of these, 251 occurred during inpatients stays and 26 in outpatient settings. However, only 126 of these events were reported in the Internal Risk Management System (RISI), reflecting a 55% underreporting rate when compared to nursing records. Among the falls reported in RISI, 46% were classified as no-harm incidents, 41% as incidents with mild harm, 5% with moderate harm, 4% with severe harm, and none resulted in death. It is noteworthy that data received from the RISI group may contain inaccuracies due to 4% of cases lacking classification, and deaths were not reported by the RISI group (Table I).

Patients' characterization

Eight patients sustained a fracture resulting from an inpatient fall, corresponding to 3% of all falls reported by the nursing team and 6% of those recorded in the RISI.

Internal Medicine accounted for the highest proportion of cases (n=3; 37.5%), likely reflecting the high number of inpatient beds within the department (Table II). Most falls (n=7; 87.5%) were unwitnessed.

Among the eight patients who sustained a fracture following an inpatient fall, the majority (n=7; 89%) were aged 65 or older, with a median age of 73.5 years (IQR: 69.5–80), and 62.5% were male. All patients were living in their own homes prior to hospitalization (Table III).

Regarding baseline functional status, according to the Clinical Frailty Scale (CFS), among the patients aged over 65 years (n=7, 87,5%), four (n=4; 43%) were classified as frail (CFS ≥ 5), while the remaining three (n=3; 57%) were considered non-frail (CFS 1–4).

The majority of patients (n=7, 87,5%) had a high risk of fall at admission based on the Downtown scale.

Only half of these patients underwent nutritional assessment at admission, and among those assessed, 75% were found to be malnourished.

Regarding the timing of the fall during hospitalization, 50% (n=4) occurred more than four weeks after admission, while 37.5% (n=3) occurred within the first week.

The most common fracture site was the proximal femur (50%), followed by the humerus (25%), malleolus (12.5%), and vertebra (12.5%). Most fractures occurred on the right side (62.5%), and only 25% of patients underwent surgical intervention.

Regarding fall risk factors, 75% of patients (n = 6) were taking tranquilizers, sedatives, and/or psychotropic medications, and 75% (n=6) were on antihypertensive therapy. Additionally, 62.5% (n=5) of patients presented with a confused mental state, and 62.5% (n=5) exhibited gait instability (Figure 1).

TABLE I. Number of Falls Reported by Nursing Records and the Internal Risk Management System (RISI), 2023

Variable		Patients % (n)
Falls reported by RISI		126
Location	Santa Maria Hospital	101 (80)
	Pulido Valente Hospital	25 (20)
Severity	No harm	58 (46)
	Mild harm	52 (41)
	Moderate harm	6 (5)
	Severe harm	5 (4)
	Deaths	--
Falls reported by the nursing staff		277
In-hospital setting	Inpatient	251 (91)
	Outpatient	26 (9)

TABLE II. Hospital context of patients with fracture following an inpatient fall (n=8)

Variable		Patients % (n)
Hospital	Santa Maria Hospital	7 (87,5)
	Pulido Valente Hospital	1 (12,5)
Unit	Cardiology	1 (12,5)
	Intensive Care	1 (12,5)
	Gastroenterology	1 (12,5)
	Pneumology	1 (12,5)
	Psychiatry	1 (12,5)
	Internal Medicine	3 (37,5)
Witnessed fall	Yes	1 (12,5)
	No	7 (87,5)

TABLE III. Clinical and demographic characteristics of patients with fall-related fractures. CVID: Common Variable Immunodeficiency.

Patients	Age	Sex	CFS	Pre-hospitalization residence	Unit	Reason for admission	Fall risk (Downton scale)	Nutritional assessment	Type of fracture	Surgery	Surgical status	Circumstances of the fall	Length of in-hospital stay	Discharge destination	Vital status
1	88	F	6	Own home	Internal medicine	Fall in the community	High risk	Not performed	Humerus	No	No surgical indication	Not described	62 days	Nursing home	Death within 120 days
2	79	F	4	Own home	Psychiatry	Psychotic disorder	High risk	Normal	Malleolus	No	No surgical indication	Fall from bed	167 days	Hospital-at-home care	Alive
3	25	F	N/A	Own home	Gastroenterology	Enteropathy associated with CVID	Low risk	Malnutrition	Humerus	No	Unfit for surgery	Fall from the commode chair	65 days	Convalescence unit	Death within 120 days
4	75	M	6	Own home	Internal medicine	Pneumonia	High risk	Not performed	Proximal femur	Yes	Operated	Fall from the armchair	56 days	In-hospital death	In-hospital death
5	72	M	2	Own home	Internal medicine	Dizziness and imbalance	High risk	Malnutrition	Proximal femur	No	Outside area of residence	Found on the floor of the hospital room	28 days	In-hospital death	In-hospital death
6	70	M	7	Own home	Cardiology	Decompensated heart failure	High risk	Malnutrition	Vertebra	No	Reason not specified	Found on the floor of the hospital room	48 days	In-hospital death	In-hospital death
7	69	M	3	Own home	Intensive care	Lower limb bypass occlusion	High risk	Not performed	Proximal femur	Yes	Operated	Fall due to slipping on a wet floor	53 days	In-hospital death	In-hospital death
8	81	M	7	Own home	Pneumology	Pneumonia	High risk	Not performed	Proximal femur	No	Unfit for surgery	Fall from the armchair	31 days	In-hospital death	In-hospital death

As for fracture-specific risk factors, the most frequently observed were the occurrence of a previous fracture and the use of glucocorticoids, each present in 37.5% of patients (n = 3) (Figure 2).

In terms of outcomes, the overall mortality rate was 87.5%, with 62,5% of patients dying during hospitalization and 25% after discharge. Only one patient (12.5%) was alive at 120 days post-fracture (Table IV).

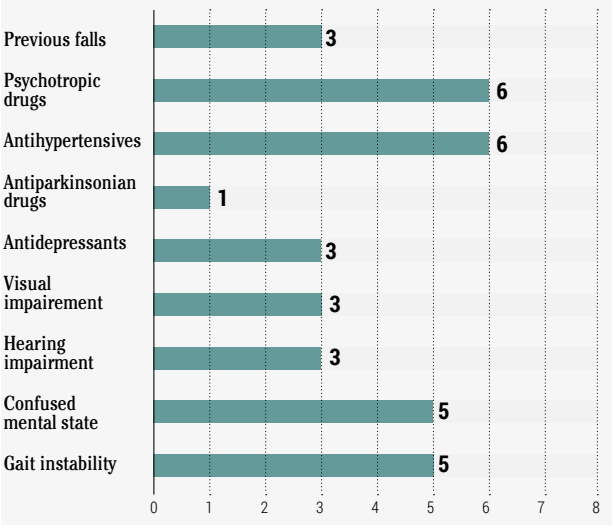

Fig 1. Fall risk factors, based on Downtown criteria.

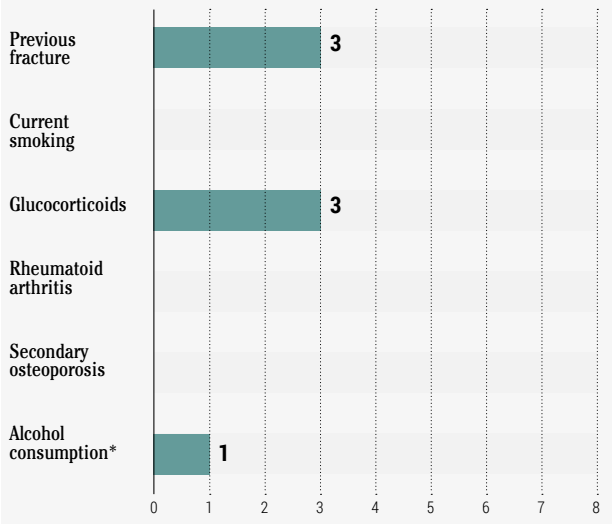

Fig 2. Fracture risk factors, based on FRAX criteria. * ≥3 units/day

TABLE IV. Characteristics of patients with fracture.

Variable		Patients n (%)
Age	< 65	1 (11)
	≥ 65	7 (89)
Sex	Female	3 (37,5)
	Male	5 (62,5)
Pre-fracture residence	Own home	8 (100)
	Institution	0 (0)
CFS (patients > 65 years) n=7	< 5 (non frail)	3 (43)
	≥ 5 (frail)	4 (57)
ECOG	0	0 (0)
	1	3 (37,5)
	2	1 (12,5)
	3	3 (37,5)
	4	1 (12,5)
Downton risk scale at admission	High risk	7 (87,5)
	Low risk	1 (12,5)
Nutritional assessment at admission	Normal	1 (12,5)
	Malnutrition	3 (37,5)
	Not performed	4 (50)
Location of fracture	Proximal femur	4 (50)
	Humerus	2 (25)
	Malleolus	1 (12,5)
	Vertebra	1 (12,5)
Fracture Side	Right	5 (62,5)
	Left	2 (25)
	N/A	1 (12,5)
Submitted to Surgery	Yes	2 (25)
	No	6 (75)
Length of stay	< 15 days	0 (0)
	16 – 30 days	1 (12,5)
	31 – 60 days	4 (50)
	> 60 days	3 (37,5)
Time from admission to fracture	< 1 week	4 (50)
	1 – 2 weeks	1 (12,5)
	2 – 4 weeks	1 (12,5)
	> 4 weeks	2 (25)
Patient Outcome Following Fracture	Death during hospitalization	5 (62,5)
	Discharged to Nursing home	1 (12,5)
	Discharged to Convalescence unit	1 (12,5)
	Discharged to Hospital-at-home care	1 (12,5)
	Returned to own home	0 (0)
Length of stay until discharge (discharged patients) n=3	< 15 days	0 (0)
	16 – 30 days	0 (0)
	31 – 60 days	0 (0)
	> 60 days	3 (100)
Length of stay until death (Patients who died during hospitalization) n=5	< 15 days	0 (0)
	15 – 30 days	2 (40)
	31 – 60 days	3 (50)
	> 60 days	0 (60)
Vital status at 30 days	Alive	3 (37,5)
	Deceased	5 (62,5)
Vital status at 120 days	Alive	1 (12,5)
	Deceased	7 (87,5)
Vital status at 1 year	Alive	1 (12,5)
	Deceased	7 (87,5)

Length of hospital stay varied, with a median of 55 days (IQR: 45,5–64,5). Among the three patients discharged alive, all had hospital stays exceeding 60 days. For those who died during hospitalization, two (n=2, 40%) died within 15–30 days and three (n=3, 60%) within 31–60 days. At 30 days post-fracture, 62,5% of patients were deceased.

Post-discharge destinations reflected significant loss of independence. Of the three patients discharged alive, one was transferred to a nursing home, one to a convalescence unit, and one received care through a hospital-at-home program. None were able to return to independent living at home.

DISCUSSION

Our study revealed a discrepancy between the number of falls recorded by the nursing team (n=277) and those officially reported in the RISI, which totaled only 126 events. Based on the nursing records, this corresponds to a rate of 0.6 falls per 1,000 patient - days, with an even lower rate when considering only events reported through RISI. This demonstrates that falls are infrequently reported through official channels. In our study, injury severity was assessed among falls reported in RISI: 46% resulted in no harm, 41% in mild harm, 5% in moderate harm, and 4% in severe harm. Of the falls recorded by the nursing team, 3% resulted in a fracture. Despite their low incidence, these fractures had a relevant clinical impact, with a 30-day post-fracture mortality rate of 71% and a 120- day and 1-year mortality rate of 88%.

Studies show that hospital fall rates vary between 3 and 11 per 1,000 patient -days[4]. However, in the present study at ULSSM, only 277 falls were reported by the nursing staff, corresponding to 0.6 falls per 1,000 patient-days, and even fewer, were reported through the RISI. This discrepancy compared to other studies raises the hypothesis of a significant underreporting of falls in our hospital.

Half of the falls that lead to fractures (n=4; 50%) occurred at the beginning of the hospital stay and 25% took place during prolonged hospitalizations lasting over one month. These findings highlight three important points: the importance of performing a fall risk assessment at the time of admission, as this is when most falls occur; the fact that fractures contribute to an increased length of hospital stay; and that prolonged hospitalizations are also associated with a higher risk of adverse events, such as falls resulting in fractures.[11,12]

It is noteworthy that most falls resulting in fractures occurred in the patient's room, with the most frequent situations being falls from the armchair (n=2; 25%) and the patient being found on the bedroom floor during the night (n=2; 25%)

Fracture mortality

In the study by Khawar et al. [2021], which evaluated mortality among patients with proximal femur fractures occurring in both hospital and community settings, the 30-day and 1-year mortality rates were significantly higher in the inpatient group compared to the outpatient group. The mortality rate in the inpatient group was 44% [13], which is considerably lower than the 87.5% mortality observed in our study. However, it should be noted that our study is based on a small sample size.

One may wonder whether this high mortality rate is attributable to pre-existing significant comorbidities in patients prior to the fall that caused the fracture, or whether the fracture itself was the primary contributor to mortality. Although we cannot definitively answer this question, we know that 37.5% of the patients had an ECOG performance status of 1, and only 12.5% had ECOG 4. That is, 37.5% of the sample were independent, with only restrictions on strenuous physical activities. Nevertheless, out of the 8 patients in the sample, only one was alive 120 days after the fall. Based on this information, we can infer that fractures resulting from in-hospital falls are associated with a substantial increase in mortality.

In addition, it is striking that no in-hospital deaths were recorded in the incident reporting system, even though five (62.5%) of the patients who experienced a fall subsequently died during the same hospital stay. This discrepancy raises concerns about the completeness of incident reporting and suggests the possibility that deaths associated with falls may be underreported due to factors such as ambiguity in attributing causality, reluctance to report severe outcomes, or limitations in the integration of reporting systems with clinical documentation. These hypotheses highlight the need to improve the accuracy and comprehensiveness of fall-related incident reporting.

Furthermore, a relevant finding was that only 25% of the patients (n=2) underwent surgery. Upon analyzing the reasons why the remaining patients were not operated on, it was found that, among the 6 patients who did not undergo surgical intervention, two- thirds

had no surgical indication, two-thirds were deemed unfit for surgery due to their clinical condition, and one patient was not operated on because they were outside their usual area of residence.

Length of hospital stay and risk factors for falls

In this study, we observed that 62,5% of the patients had a hospital stay shorter than 60 days, while 37,5% had a stay longer than 60 days. In both cases, these represent substantially prolonged hospitalizations. However, it is noteworthy that all patients in the group with a hospital stay shorter than 60 days were those who died during hospitalization, whereas all patients who were discharged had hospital stays longer than 60 days. This finding highlights the significant impact of fractures on prolonging hospital stay as well as the poor prognosis associated with these fractures.[12]

In our study, the most prevalent risk factors for falls were the use of psychotropic drugs and antihypertensive medication, followed by a confused mental state and gait instability — all of which are widely recognized in the literature as established risk factors for falls.[14]

Prevention

The fall prevention protocol of Sant Maria Hospital (part of ULSSM) stipulates the use of the Downton Scale to assess the risk of falls in hospitalized patients, as it is more sensitive to the characteristics of patients during hospitalization[15].

In this study, none of the patients were under physical restraints at the time of the fall that caused the fracture; however, four patients were subsequently subjected to physical restraints (three on the same day or the following day, and one a week later). Comparing these findings with the evidence, there is no scientific evidence comparing the use of bedrails in preventing falls among hospitalized older adults to no use of bedrails or any type of physical restraints[12]. Moreover, other studies state that restraints have been shown to increase both fall rates and serious injuries[14]. There are no data regarding the use of chemical restraints in this patient sample.

At ULSSM, fall risk assessment is performed at admission, every five days, after any change in the patient's condition, and at discharge. Based on the identified fall risk and individual patient risk factors, a personalized management plan is established. The approach is centered on patient education—for example, instructing the patient to wait for assistance before attempting to stand, if applicable—and on managing and organizing the physical environment, including lowering and locking beds, installing handrails in corridors, and ensuring the patient has access to a call bell from the bed. Similarly, the family plays an important role, given that the presence of a caregiver continuously accompanying the patient during hospitalization is essential, as is their education in fall prevention strategies[15].

Therefore, having sufficient nursing staff is crucial for effective fall prevention, ensuring nurses have time to monitor patient safety and implement preventive measures[16]. The 2025 study by Chiu et al. provided evidence of a significant increase in fall rates and a decrease in completion of assessments when occupancy levels exceeded certain thresholds[17].

Chair alarms, bed alarms and wearable sensors have not been associated with significant reductions in falls[18], therefore not used at ULSSM.

Fall prevention in inpatient units can not only help hospitals improve patient care, reduce the risk of serious injury, shorten hospital stays, and lower costs but also assist in hospital communication and teamwork[19].

This study presents several strengths. It addresses a highly relevant and current clinical issue: in-hospital falls, with a particular focus on those resulting in fractures—a rare but severe event with significant clinical consequences and impact on patient outcomes. A major strength lies in its dual approach: on one hand, it presents a quantitative analysis of the overall prevalence of falls recorded in the hospital during 2023, revealing a substantial discrepancy between events documented by the nursing team and those officially reported in the RISI system, thereby exposing a considerable degree of underreporting. On the other hand, it provides a qualitative and descriptive analysis of fall-related fractures, contributing to a deeper understanding of the clinical and functional profile of these patients, the associated risk factors, and the subsequent outcomes. Notably, the findings — particularly the high post-fracture mortality rate and the absence of in-hospital deaths recorded in the incident reporting system—raise important concerns about the robustness and sensitivity of current institutional surveillance tools. These results underscore the need to strengthen adverse event reporting systems and to improve the integration between clinical documentation and institutional monitoring process.

This study also has limitations that should be acknowledged. First, the retrospective nature of the data collection, which relied on existing clinical re-

cords, may affect the completeness and accuracy of the information available. Important variables might be missing or inconsistently documented. Second, the generalizability of the findings is limited, as the data were derived from a single hospital center and the sample who sustained fractures after falls was small, limiting the statistical power and the ability to generalize findings related to this subgroup. Third, due to the observational design of the study, it is not possible to establish causal relationships between the factors analyzed and the occurrence of fractures or mortality. Associations observed should therefore be interpreted with caution. Finally, there is a high likelihood of underreporting of falls. Falls that did not result in immediate visible consequences may not have been recorded in the hospital system. Furthermore, the lack of standardization in documenting falls—such as inconsistencies regarding the circumstances, fall dynamics, and whether witnesses were present—may compromise the analysis of severity and associated factors.

Despite the inherent limitations of a retrospective design and reliance on clinical records, this study represents an important first step in addressing the underrecognition of in-hospital falls as a critical patient safety issue. The findings highlight the urgent need to foster a culture of safety among healthcare professionals, promoting awareness of the serious clinical and systemic consequences of falls, and to improve institutional reporting practices through optimized, user-friendly systems. Moreover, the results reinforce the importance of implementing individualized fall prevention strategies and early multidisciplinary management of patients who sustain fractures, potentially through dedicated services such as orthogeriatric units. These findings lay the groundwork for future prospective studies aimed at evaluating targeted interventions to reduce the incidence and severity of falls in hospitalized patients.

CONCLUSION

This study reveals not only a likely underreporting of in-hospital falls but also the serious clinical impact of fall-related fractures, which were associated with a markedly high mortality rate of 87.5% in the study population.

REFERENCES

1. **Bouldin ELD, Andresen EM, Dunton NE, Simon M, Waters TM, Liu M, et al.** Falls among adult patients hospitalized in the United States: prevalence and trends. *J Patient Saf*. 2013 Mar;9(1):13–7.
2. **Romão AL, Nunes S.** Quedas em internamento hospitalar: causas, consequências e custos: estudo de caso numa unidade hospitalar de Lisboa. *Port J Public Health*. 2018;36(1):1–8.
3. **Slade SC, Carey DL, Hill AM, Morris ME.** Effects of falls prevention interventions on falls outcomes for hospitalised adults: protocol for a systematic review with metaanalysis. *BMJ Open*. 2017 Nov;7(11):e017864. doi:10.1136/bmjopen2017017864.
4. **Heng H, Jazayeri D, Shaw L, Kiegaldie D, Hill AM, Morris ME.** Hospital falls prevention with patient education: a scoping review. *BMC Geriatr*. 2020 Apr 15;20(1):140. doi:10.1186/s1287702001515w.
5. **World Health Organization.** WHO global report on falls prevention in older age. Geneva: World Health Organization; 2007.
6. **Perracini LR, Ramos LR.** Fallrelated factors in a cohort of elderly community residents. *Rev Saúde Pública*. 2002;36(6):709–16.
7. **Berg R, Cassells J.** The Second Fifty Years: promoting health and preventing disability. 1992.
8. **Schwendimann R, Bühler H, De Geest S, Milisen K.** Falls and consequent injuries in hospitalized patients: effects of an interdisciplinary falls prevention program. *BMC Health Serv Res*. 2006 Jun 7;6:69.
9. **Afonso Henriques AD.** Prevenção e intervenção na queda do adulto em cuidados hospitalares. Lisboa: DireçãoGeral da Saúde; 2019.
10. **World Health Organization.** The conceptual framework for the international classification for patient safety. Geneva: World Health Organization; 2010. Available from: https://www.who.int/publications/i/item/WHOIERPSP2010.2
11. **Tanaka B, Sakuma M, Ohtani M, Toshiro J, Matsumura T, Morimoto T.** Incidence and risk factors of hospital falls on longterm care wards in Japan. *J Eval Clin Pract*. 2012 Jun;18(3):572–7. doi:10.1111/j.13652753.2010.01629.x.
12. **Heikkilä A, Lehtonen L, Junttila K.** Consequences of inpatient falls in acute care: a retrospective register study. *J Patient Saf*. 2024 Aug;20(5):340–4.
13. **Khawar H, Craxford S, Marson BA, Rahman HP, Ollivere B.** Outcomes after hip fractures sustained in hospital: a propensityscore matched cohort study. *Injury*. 2021 Aug;52(8):2356–60.
14. **Yang H, Jiang Y, Yang X, Zhu C, Luo L, Hao W.** Assessment of risk factors for falls in hospitalized older adults: a metaanalysis. *Res Gerontol Nurs*. 2024 Sep;17(5):238–45.
15. **Hospital Santa Maria.** Prevenção de quedas nos doentes internados. Lisboa: [editora desconhecida]; 2008.
16. **Li S, Surineni K.** Falls in hospitalized patients and preventive strategies: a narrative review. *Am J Geriatr Psychiatry Open Sci Educ Pract*. 2025 Mar;5(1):1–9.
17. **Chiu J, Sarhangian V, Tosoni S, Pozzobon LD, Chartier LB.** Associations of hospital unit occupancy with inpatient falls and fallrisk assessment completion: a retrospective cohort study. *Int J Qual Health Care*. 2025 Apr 24;37(2):mzaf028.
18. **Morris ME, Webster K, Jones C, Hill AM, Haines T, McPhail S, et al.** Interventions to reduce falls in hospitals: a systematic review and metaanalysis. *Age Ageing*. 2022 May;51(5):afac098.
19. **McLennan C, Sherrington C, Suen J, Nayak V, Naganathan V, Sutcliffe K, et al.** Features of effective hospital fall prevention trials: an intervention component analysis. *BMC Geriatr*. 2024 Dec;24(1):1–14.

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CLINICAL AND BASIC SCIENCE REVIEW

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Oropouche Fever on the Rise: Overview of a Reemerging Arbovirus in Latin America

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ABSTRACT: Oropouche virus is a reemerging arbovirus in Latin America, responsible for multiple outbreaks since its first identification in 1955. Following decades of sustained circulation in the Amazon region, it has recently spread to previously unaffected areas, particularly since late 2023, raising new public health concerns. Despite its growing relevance, it remains largely underdiagnosed, often confused with other arboviral diseases, and overlooked by surveillance systems.

This narrative review synthesizes current knowledge on Oropouche, drawing on literature published between 1962 and 2025, with particular focus on developments from 2023 onward. Sources were selected primarily from PubMed to provide an updated and concise overview of its epidemiology, transmission, clinical manifestations, diagnostic challenges and public health impact.

The virus is primarily transmitted by *Culicoides paraensis*, a biting midge, and has been reported in several South American and Central American countries, including Argentina, Barbados, Bolivia, Brazil, Colombia, Cuba, Ecuador, Guyana, Panama, Peru and Venezuela. Imported cases notified in North America and Europe highlight its potential for a wider geographic spread. Clinically, Oropouche fever usually presents as a self-limiting febrile illness that can mimic dengue, Zika or chikungunya. However, recent reports have described neurological complications, including meningitis and meningoencephalitis, as well as possible vertical transmission and congenital malformations, suggesting a broader disease spectrum. To date, five deaths have been attributed to the virus, with others under investigation. Diagnostic capacity remains limited, especially in endemic areas, and no specific treatment exists beyond supportive care.

The continued expansion of Oropouche, driven by climate change, urbanization and increased human mobility, underscores the need for improved surveillance and research. Without sustained attention, this emerging infection may evolve into a more serious threat to global health.

KEYWORDS: Oropouche Fever, Arbovirus, Public Health, Emerging Diseases, Epidemiology.

I. INTRODUCTION

Arboviruses, viral infections transmitted by arthropods, currently represent a growing threat to global public health — not only due to the increasing incidence reported over recent decades, but also because of their multifaceted and far-reaching societal impact[1]. Dengue is, undoubtedly, the most prominent example within this group, with an estimated 100 million cases per year and a broad geographic distribution, documented across all inhabited continents[2,3]. Its transmission dynamics vary regionally, ranging from sustained endemicity to sporadic or emerging outbreaks[4,5].

However, in recent decades, new arboviruses have continued to emerge and reemerge, with the potential to expand further and, although unlikely, reach the epidemiological scale of dengue[6,7].

Oropouche fever (OF) has emerged within this context as a reemerging arboviral disease, historically endemic in Latin America, particularly in the northern region of Brazil and the western Amazon basin, but still largely underrepresented in Western scientific literature [8–10]. The sharp increase in reported cases since late 2023, along with a recent geographic expansion — including imported cases in the United States, Canada and several European countries — has raised concerns regarding its potential for transcontinental dissemination[8,11].

II. ETIOLOGY AND TRANSMISSION CYCLE

This tropical disease is caused by the Oropouche virus (OROV), an arbovirus of the genus *Orthobunyavirus*, family *Peribunyaviridae,* and the order *Bunyavirales*. It is part of the Simbu serological group, which comprises various genetically related arboviruses of both medical and veterinary significance[9,12,13].

OROV exhibits a spherical morphology and is composed of a helical nucleocapsid that encloses the viral genome, itself surrounded by a lipid envelope. As observed in other members of the *Orthobunyavirus genus*, its genome consists of a negative-sense, single-stranded RNA, segmented into three parts: small (S), medium (M) and large (L)[9]. This segmented structure enables reassortment events to occur — a key driver of genetic diversity within this viral group. Reassortment takes place when two genetically compatible viruses co-infect the same host cell, facilitating the exchange of entire genome segments[2,14,15]. This mechanism contributes to the emergence of novel viral lineages with distinct genetic and phenotypic profiles, potentially altering pathogenicity, transmissibility and epidemiological dynamics. Among the best-characterized OROV lineages are the Iquitos, Madre de Dios and Perdões strains[14,15].

This vector-borne disease is primarily transmitted through the bite of *Culicoides paraensis*, a hematophagous dipteran species widely distributed across Latin America[16]. This species thrives in both natural environments and human-altered areas, including rural and urban settings[17]. The genus *Culicoides,* to which it belongs, has a global distribution and serves as a vector for a wide range of diseases, predominantly of veterinary importance. Notable examples include bluetongue virus (BTV), epizootic hemorrhagic disease virus (EHDV), Akabane virus (AKAV), bovine ephemeral fever virus (BEFV) and African horse-sickness virus (AHSV)[9,18].

Two distinct transmission cycles of OROV have been described: a sylvatic cycle, occurring in forested environments, and an urban cycle, associated with densely populated areas, ranging from small rural settlements to major urban centers. The urban cycle is particularly linked to settings involving either agricultural activity or proximity to large, forested areas[16].

In the sylvatic cycle, mosquitoes such as *Coquillettidia venezuelensis* and *Aedes serratus* —historically isolated in Trinidad and Brazil, respectively — have been identified as potential vectors. Reservoir hosts in this cycle include small mammals such as sloths, as well as primates, rodents and birds, as antibodies to OROV have been reported in all these animals. In contrast, the urban (or epidemic) cycle is predominantly maintained by the primary vector *Culicoides paraensis*. A key factor linking both cycles appears to be the human host, who, upon moving from the sylvatic environment to the urban environment and carrying a sufficiently high viremia, may act as the primary vertebrate reservoir, thereby sustaining urban transmission[6,9].

The transmission dynamics remain incompletely understood, particularly because the vectors and sylvatic hosts identified in the literature are based on historical isolations (mostly conducted in Brazil) that lack robust validation and contemporary confirmation[15,17,19]. Therefore, the most recent evidence suggests caution in determining the competent agents involved in vector-borne transmission[20]. To date, only *C. paraensis* has been conclusively demonstrated to be an effective vector. Recent entomological studies have also highlighted the susceptibility of *Culicoides sonorensis* to the virus under laboratory conditions. This finding is noteworthy, as it could signify an emerging shift in the geographical range of this arbovirus, considering that this vector is primarily distributed in temperate regions, particularly in central North America[14,20].

Mosquitoes of the *Culicidae* family, such as *Aedes aegypti*, *Aedes albopictus* and *Culex quinquefasciatus*, have been evaluated in experimental studies. However, to date, their vector competence has not been conclusively demonstrated[14,20]. Therefore, there is an urgent need for further research focusing on the vec-

tor competence of *Culicoides* species in both enzootic and non-enzootic areas, as well as other arthropods, particularly those belonging to the genera *Aedes* and *Culex*[20,21].

III. EPIDEMIOLOGY

Oropouche virus was first isolated in 1955 from the blood of a forest worker presenting with an acute febrile illness, residing in Vega de Oropouche, in Trinidad and Tobago[15,22]. In 1961, the first documented outbreak occurred in Belém, the capital of the state of Pará, Brazil, with over 11,000 reported cases, thereby demonstrating the epidemic potential of OROV. Initially confined to the state of Pará, the virus has progressively expanded within the Amazon region since 1981[6].

Sustained local transmission has extended across several countries in Latin America and the Caribbean over recent years, with reported cases in Argentina, Barbados, Bolivia, Colombia, Cuba, Ecuador, Guyana, Panama, Peru and Venezuela[2,11]. Since late 2023, epidemiological data have shown a significant increase in infections, with a total of 16,239 cases reported in 2024, including four deaths and five instances of vertical transmission. Of these, 13,785 were recorded in Brazil, accounting for 84.9% of all confirmed infections. Among the Andean countries, Peru reported 1,263 cases (7.8%), followed by Colombia with 626 cases (3.8%). For the first time, cases have been reported in North America (Canada and the United States) and in Europe (Spain, Italy and Germany). All of these were classified as imported cases, with a confirmed epidemiological link to endemic areas[11,23,24].

A large-scale outbreak is ongoing in the Americas[11,25]. According to the Pan American Health Organization (PAHO), by the fourth epidemiological week of 2025, a total of 3,765 cases had already been reported, with 97.7% occurring in Brazil (3,678 cases)[11]. Recent data released by the Brazilian Ministry of Health indicate a significant increase in case numbers compared to 2024. Between epidemiological weeks 1 and 20 of 2025, a total of 10,571 cases of Oropouche fever were reported in the country, representing a 57.9% increase compared to the same period in the previous year[26]. This upward trend confirms not only the persistence of active transmission but also the intensification of the epidemic cycle, potentially associated with changes in ecological, climatic and social conditions[6,25].

IV. CLINICAL MANIFESTATIONS

From a clinical standpoint, OF typically manifests as a sudden-onset febrile syndrome, following an incubation period ranging from 1–10 days. Clinical manifestations frequently include headache, myalgia, arthralgia, retro-orbital pain, nausea, vomiting and photophobia — features that closely mimic those of dengue fever. In some cases, a maculopapular rash resembling that of rubella may be observed, as well as mild hemorrhagic signs such as epistaxis, gingival bleeding or petechiae[2,21,27].

The symptomatic phase generally lasts between 2–7 days, marking the acute stage of infection. However, in approximately 60% of cases, a relapse of symptoms occurs after a brief asymptomatic interval of several days or weeks. The recurrent manifestations tend to mirror those of the initial episode, albeit typically with reduced intensity[15,27].

Although rare, Oropouche fever can evolve into more severe manifestations, such as aseptic meningitis or meningoencephalitis. These complications can present with intense occipital pain, dizziness, confusion, lethargy, photophobia, nausea, vomiting, nuchal rigidity and nystagmus[27]. Notably, among the reported neurological complications, an association between Oropouche fever and Guillain-Barré syndrome has been described in three patients in Cuba in the last year[28,29]. These findings highlight potential, though still poorly understood, neuroinvasive capacity of the virus[29].

This arboviral infection is often self-limiting and generally presents with a benign clinical course. Nevertheless, two fatalities were confirmed in 2024, in previously healthy young women, aged 21 and 24, whose clinical presentations resembled those of severe dengue[30,31]. Both patients developed headache, fever, nausea, vomiting, myalgia, abdominal pain, diarrhea and retroorbital pain. The younger woman also developed arthralgia and a red-colored rash, as well as hemorrhagic signs, such as petechiae and spontaneous bleeding from the gums, nose and vagina[30]. Both succumbed to OROV infection just four to five days after symptom onset, according to the clinical reports, due to severe coagulopathy and liver impairment[31]. The underlying pathophysiological mechanisms responsible for such severe manifestations remain poorly understood. One potential explanation for this outcome involves the co-circulation of distinct viral clades possibly eliciting a non-protective heterologous immunity, capable of trig-

gering the Antibody-Dependent Enhancement (ADE) as has been observed in severe dengue[2,32].

A more recent concern associated with OF is the possibility of vertical transmission. In Brazil, in 2024, four cases of fetal death and one case of congenital malformation were reported among pregnant women with a confirmed diagnosis of acute OROV infection, with several other cases currently under investigation[11,33]. In one stillbirth, viral RNA was detected in the umbilical cord blood as well as in fetal tissues including the placenta and central nervous system[33]. While the exact mechanism of intrauterine transmission remains unclear, current evidence suggests a link between maternal viremia and binding to placental surface receptors, which may facilitate transplacental passage into the fetal bloodstream[8,30]. Beyond the possibility of vertical transmission, OROV was identified in a semen sample from a previously healthy man following travel to Cuba, suggesting potential sexual transmission[8].

V. DIAGNOSTIC APPROACH AND THERAPEUTIC CONSIDERATIONS

The clinical diagnosis of Oropouche fever poses considerable challenges, primarily due to its nonspecific presentation and the significant clinical overlap with other arboviral infections, including dengue, Zika, chikungunya and Mayaro[21]. Diagnostic suspicion should be based on a thorough epidemiological assessment, considering recent travel to endemic regions, residence in areas with ongoing active transmission or documented exposure to known vectors[27].

Laboratory findings tend to be subtle and nonspecific, commonly encompassing leukopenia, lymphopenia, elevated C-reactive protein levels and mild to moderate elevations in hepatic transaminases[9,27]. According to the diagnostic protocol established by the Centers for Disease Control and Prevention (CDC), the gold standard method for diagnosis during the acute phase is reverse-transcription polymerase chain reaction (RT-PCR). Ideally, it should be performed within the first seven days following symptom onset, when viral RNA remains detectable in the blood or other clinical specimens[34]. During the convalescent phase, the gold standard serological method is the plaque reduction neutralization test (PRNT), owing to its superior specificity in distinguishing Oropouche virus antibodies from those of antigenically related *Orthobunyaviruses*[2,34]. While recommended, this method is not often used for patient diagnosis due to long turnaround times and the requirement for high-containment laboratory conditions[2].

Alternative immunoassays, such as enzyme-linked immunosorbent assay (ELISA), are often employed as complementary methods or substitutes for other serological techniques; however, their diagnostic utility is constrained by the risk of cross-reactivity, particularly in regions with co-circulation of related arboviruses[10]. In addition to the aforementioned methods, the literature describes other conventional serological techniques, such as hemagglutination inhibition, complement fixation and indirect immunofluorescence assay[9].

As previously mentioned, the diagnosis of Oropouche fever can be established through a wide array of laboratory tests. The selection of the most appropriate test should consider the clinical phase of the disease, the time elapsed since symptom onset and the availability of these diagnostic tools[34]. A major challenge lies in the decentralized availability of these diagnostic tests and the urgent need to develop rapid point-of-care testing solutions[2,9].

Treatment is symptomatic and is based on supportive care, including the use of analgesics and antipyretics, while nonsteroidal anti-inflammatory drugs should be avoided due to the risk of hemorrhagic complications, similar to those observed in other arboviral infections such as dengue[21]. Thus far, no antiviral agent has demonstrated sufficient efficacy to warrant clinical recommendation[2].

VI. PREVENTION AND CONTROL

Since Oropouche fever is transmitted through the bite of an arthropod vector, preventive measures primarily focus on vector control and the use of personal protective equipment[35]. Regular application of insect repellents, along with the use of appropriate clothing, such as loose-fitting and breathable garments that cover exposed skin, is strongly recommended. Furthermore, households should be protected with fine-mesh screens on doors and windows, a strategy that also contributes towards the prevention of other arboviral infections. In endemic regions, local authorities should also implement integrated environmental management and entomological surveillance programs to reduce vector proliferation[11].

Although the burden of Oropouche fever is predominantly concentrated in endemic areas, the current dynamics of human mobility and globalization present

significant challenges to international public health[21]. The potential for imported cases in non-endemic countries, such as Portugal, must not be underestimated, particularly considering previous reports of imported cases within Europe. Portugal may serve as an entry point for emerging and reemerging arboviruses, given the increasing volume of international travel and the effects of climate change, which favor the establishment of new vector species[24,36].

For this reason, in Portugal, efforts should be directed at early recognition of imported cases from endemic regions, which requires the promotion of medical literacy regarding the clinical manifestations of the disease, as well as the development of robust laboratory diagnostic capacities. OF must be considered in the differential diagnosis of acute febrile syndromes, neurological presentations or gestational complications in individuals with a recent travel history to Central and South America[24].

VII. RECENT ADVANCES, KNOWLEDGE GAPS AND RISK OF GLOBAL DISSEMINATION

In recent years, particularly since late 2023, Oropouche fever has attracted growing attention from the international medical and scientific community. This is reflected in the significant increase in recent scientific publications, as well as in the number of clinical guidelines and recommendations issued by international entities such as the World Health Organization, the Pan American Health Organization and the Centers for Disease Control and Prevention[11,37,38]. This collective effort has led to several advances in scientific literature and in the overall understanding of the disease, though various topics remain understudied.

Among the most relevant developments is the genetic characterization of the virus, including the identification of distinct viral lineages, notably the most recently described OROVBR-2015–2024 strain, which has been associated with the virus's recent reemergence in Brazil[8,16]. In addition, there has been a growing effort to elucidate the transmission cycle and to assess the vector competence of various hematophagous species, especially regarding the role of *Culicoides* species as vectors and their geographic distribution[14,20]. Furthermore, the increasing number of clinical case reports has also provided a better understanding of the clinical spectrum of the disease, helping to identify previously unrecognized manifestations[27,28,31,33,39].

Despite these advances, significant knowledge gaps remain. The pathogenesis of the virus remains poorly understood, often inferred from data on other *Orthobunyaviruses*, limiting our understanding of disease-specific mechanisms[14,40]. The sylvatic transmission cycle, including its reservoir hosts and secondary vectors, has yet to be fully characterized, with most of the current understanding based on historical and geographically restricted studies[8,9]. Diagnostic access continues to be a major obstacle in endemic regions, where Oropouche fever is frequently misdiagnosed as dengue or other febrile illnesses, contributing to significant underreporting and poor epidemiological visibility[2,21]. Moreover, no vaccine is currently available for Oropouche virus, further underscoring the urgent need for preventive strategies[2]. This represents a priority area for investment by public health authorities, particularly in the development of more rapid and cost-effective diagnostic tools[2,21].

According to the World Health Organization, the regional risk of OROV transmission is currently rated very high, particularly in Latin America, while the global risk remains low[37]. However, theoretical scenarios for broader dissemination should not be overlooked. These include the potential spread of infected vectors through human activities or environmental factors, and the possibility of viral adaptation to new arthropod species with broader geographic ranges, such as *Aedes aegypti*[20,37,41,42]. As such, continued surveillance, vector competence studies and preparedness measures are essential to anticipate and mitigate a potential expansion of Oropouche virus transmission beyond its traditional ecological niche[24,37,41].

REFERENCES

1. Sant'Anna MW, Ferreira ML, da Silva LF, Côrtes PL. Climate Change and Arbovirus: A Review and Bibliometric Analysis. 2025;13[1]:1–18.
2. Wesselmann KM, Postigo-Hidalgo I, Pezzi L, de Oliveira-Filho EF, Fischer C, de Lamballerie X, et al. Emergence of Oropouche fever in Latin America: a narrative review. Lancet Infect Dis. 2024;24[8]:e439–52.
3. European Centre for Disease Prevention and Control. Twelve-month dengue virus disease case notification rate per 100 000 population, June 2024 - May 2025[Internet]. Stockholm: ECDC; 2025 Jun[cited 2025 Jul 21]. Available from: https://www.ecdc.europa.eu/en/publications-data/twelve-month-dengue-virus-disease-case-notification-rate-100-000-population-june
4. World Health Organization. Dengue and severe Dengue[Internet]. Geneva: WHO; 2024[cited 2025 Jul 22]. Available from: https://www.who.int/news-room/fact-sheets/detail/dengue-and-severe-dengue

5. Bhatt S, Gething PW, Brady OJ, Messina JP, Farlow AW, Moyes CL, et al. The global distribution and burden of dengue. Nature. 2013 Apr 7;496[7446]:504–7.
6. Dye-Braumuller KC, Prisco RA, Nolan MS. (Re)Emerging Arboviruses of Public Health Significance in the Brazilian Amazon. Microorganisms. 2025 Mar 12;13[3]:650.
7. Wilder-Smith A, Gubler DJ, Weaver SC, Monath TP, Heymann DL, Scott TW. Epidemic arboviral diseases: priorities for research and public health. Lancet Infect Dis. 2017;17[3]:e101–6.
8. Ribas Freitas AR, Schwartz DA, Lima Neto AS, Rodrigues R, Cavalcanti LPG, Alarcón-Elbal PM. Oropouche Virus (OROV): Expanding Threats, Shifting Patterns, and the Urgent Need for Collaborative Research in Latin America. Viruses. 2025 Feb 28;17[3]:353.
9. Sakkas H, Bozidis P, Franks A, Papadopoulou C. Oropouche fever: A review. Viruses. 2018;10[4]:175.
10. Bai F, Denyoh PMD, Urquhart C, Shrestha S, Yee DA. A Comprehensive Review of the Neglected and Emerging Oropouche Virus. Viruses. 2025;17[3]:e521.
11. Pan American Health Organization. Epidemiological Update Oropouche in the Americas Region[Internet]. 2025 Feb. Available from: https://www.paho.org/en/documents/epidemiological-update-oropouche-americas-region-11-february-2025
12. Files MA, Hansen CA, Herrera VC, Schindewolf C, Barrett ADT, Beasley DWC, et al. Baseline mapping of Oropouche virology, epidemiology, therapeutics, and vaccine research and development. NPJ Vaccines. 2022;7[1]:119.
13. Gutierrez B, Wise EL, Pullan ST, Logue CH, Bowden TA, Escalera-Zamudio M, et al. Evolutionary Dynamics of Oropouche Virus in South America. J Virol. 2020;94[5]:e01274-19.
14. Tilston-Lunel NL. Oropouche Virus: An Emerging Orthobunyavirus. J Gen Virol. 2024;105[3]:001065.
15. Travassos Da Rosa JF, De Souza WM, De Paula Pinheiro F, Figueiredo ML, Cardoso JF, Acrani GO, et al. Oropouche virus: Clinical, epidemiological, and molecular aspects of a neglected Orthobunyavirus. Am J Trop Med Hyg. 2017;96[5]:1019–30.
16. Gräf T, Delatorre E, do Nascimento Ferreira C, Rossi A, Santos HGG, Pizzato BR, et al. Expansion of Oropouche virus in non-endemic Brazilian regions: analysis of genomic characterisation and ecological drivers. Lancet Infect Dis. 2024;24[4]:456–68.
17. Romero-Alvarez D, Escobar LE. Oropouche fever, an emergent disease from the Americas. Microbes Infect. 2018;20[3]:135–46.
18. Mellor PS, Boorman J, Baylis M. Culicoides biting midges: their role as arbovirus vectors. Annu Rev Entomol. 2000;45:307–40.
19. Pinheiro FFP, Pinheiro M, Bensabath G, Causey OR, Shope RE. Epidemia de vírus Oropouche em Belém (nota prévia). Rev Serv Esp Saúde Pública. 1962;12[1]:15–23.
20. Gallichotte EN, Ebel GD, Carlson CJ. Vector competence for Oropouche virus: A systematic review of pre-2024 experiments. PLoS Negl Trop Dis. 2025 Apr 1;19[4]:e0013014.
21. Okesanya OJ, Amisu BO, Adigun OA, Ahmed MM, Agboola AO, Kab T, et al. Addressing the emerging threat of Oropouche virus: implications and public health responses for healthcare systems. Trop Dis Travel Med Vaccines. 2025;11[1]:e117.
22. Henry R, Murphy FA. Etymologia: Oropouche Virus. Emerg Infect Dis. 2018;24[5]:937.
23. Centers for Disease Control and Prevention. Oropouche Virus Disease Among U.S. Travelers — United States, 2024. MMWR Morb Mortal Wkly Rep. 2024 Sep 5;73[35]:769–73. [cited 2025 Jul 5]. Available from: https://www.cdc.gov/mmwr/volumes/73/wr/mm7335e1.htm
24. European Centre for Disease Prevention and Control. Oropouche virus disease cases imported into the European Union[Internet]. 2024 Aug 9[cited 2025 Jul 5]. Available from: https://www.ecdc.europa.eu/en/publications-data/threat-assessment-brief-oropouche-virus-disease-cases-imported-european-union
25. Fischer C, Frühauf A, Inchauste L, Cassiano MHA, Ramirez HA, Barthélémy K, et al. The spatiotemporal ecology of Oropouche virus across Latin America: a multidisciplinary, laboratory-based, modelling study. Lancet Infect Dis. 2025;
26. Ministério da Saúde do Brasil. Informe Semanal no 14 - COE Dengue e outras Arboviroses - SE 1 a 20 | Brasília: Ministério da Saúde; 2025 May[cited 2025 Jul 22]. Available from: https://www.gov.br/saude/pt-br/assuntos/saude-de-a-a-z/a/aedes-
27. Centers for Disease Control and Prevention. Clinical Overview of Oropouche Virus Disease[Internet]. 2025[cited 2025 Jun 7]. Available from: https://www.cdc.gov/oropouche/hcp/clinical-overview/index.html
28. de Armas Fernández JR, Peña García CE, Acosta Herrera B, Betancourt Plaza I, Gutiérrez de la Cruz Y, Resik Aguirre S, et al. Report of an unusual association of Oropouche Fever with Guillain-Barré syndrome in Cuba, 2024. Eur J Clin Microbiol Infect Dis. 2024 Nov;43[11]:2233–7.
29. González-Quevedo A, Lestayo O'Farrill Z, Mustelier Becquer R. Oropouche virus – another antecedent event for Guillain–Barré syndrome? Rev Panam Salud Publica. 2025;49. Epub ahead of print.
30. Schwartz DA. Novel Reassortants of Oropouche Virus (OROV) Are Causing Maternal–Fetal Infection During Pregnancy, Stillbirth, Congenital Microcephaly and Malformation Syndromes. Genes (Basel). 2025;16.
31. Bandeira AC, Pereira FM, Leal A, Santos SPO, Barbosa AC, Souza MSPL, et al. Fatal Oropouche Virus Infections in Nonendemic Region, Brazil, 2024. Emerg Infect Dis. 2024 Nov;30[11]:2370–4.
32. Katzelnick LC, Gresh L, Halloran ME, Mercado JC, Kuan G, Gordon A, et al. Antibody-dependent enhancement of severe dengue disease in humans. Science. 2017 Nov 17;358[6365]:929–32.
33. Garcia Filho C, Lima Neto AS, Maia AMPC, da Silva LOR, Cavalcante R da C, Monteiro H da S, et al. A Case of Vertical Transmission of Oropouche Virus in Brazil. N Engl J Med. 2024 Nov 28;391[21]:2055–7.
34. Centers for Disease Control and Prevention. Updated Interim Guidance for Health Departments on Testing and Reporting for Oropouche Virus Disease[Internet]. Atlanta (GA): CDC; 2025[cited 2025 Jun 25]. Available from: https://www.cdc.gov/oropouche/php/reporting/index.html
35. Center of Disease Control and Prevention. Preventing Oropouche[Internet]. Atlanta (GA): CDC; 2024[cited 2025 Jun 23]. Available from: https://www.cdc.gov/oropouche/prevention/index.html
36. Castilletti C, Mori A, Pomari E, Matucci A, Martelli G, Curiale S, et al. First diagnoses of Oropouche virus in Europe: how can we strengthen communication and preparedness globally? The Lancet Infectious Diseases. Lancet Infect Dis. 2024 Oct;24[10]:e602–3.
37. World Health Organization. Rapid risk assessment, acute event of potential public health concern[Internet]. Geneva: WHO; 2025 May[cited 2025 Jul 9]. Available from: https://www.who.int/publications/m/item/who-rapid-risk-assessment--oropouche-virus-disease--region-of-the-americas-v.2
38. Centers for Disease Control and Prevention. 2024

Oropouche Outbreak[Internet]. Atlanta (GA): CDC; 2025[cited 2025 Jul 22]. Available from: https://www.cdc.gov/oropouche/outbreaks/2024/index.html

39. Chiang JO, Azevedo RS, Justino MCA, Matos HJ, Cabeça HLS, Silva SP, et al. Neurological disease caused by Oropouche virus in northern Brazil: should it be included in the scope of clinical neurological diseases? J Neurovirol. 2021 Aug 1;27[4]:626–30.
40. Elliott RM. Orthobunyaviruses: recent genetic and structural insights. Nat Rev Microbiol. 2014;12[10]:673–85.
41. World Health Organization. Risk Evaluation of Oropouche virus and its reassortants[Internet]. Geneva: WHO; 2025 Jun[cited 2025 Jul 23]. Available from: https://www.who.int/publications/m/item/risk-evaluation-of-oropouche-virus-and-its-reassortants
42. European Centre for Disease Prevention and Control. Dengue risk assessment for mainland EU/EEA[Internet]. Stockholm: ECDC; 2025[cited 2025 Jul 23]. Available from: https://www.ecdc.europa.eu/en/dengue/surveillance-and-updates/risk-assessment

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Prémios Pfizer

SOCIEDADE DAS CIÊNCIAS MÉDICAS DE LISBOA

28 de novembro pelas 18h

CCB – Centro Cultural de Belém, Lisboa

Os Prémios Pfizer celebram, mais uma vez, o valor da investigação científica desenvolvida em Portugal.

Neste 69º aniversário, mantemos, em conjunto com a Sociedade das Ciências Médicas de Lisboa, o compromisso de reconhecer e premiar o esforço desenvolvido por quem mais inova.

Pfizer

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JORNAL DA SOCIEDADE DAS CIÊNCIAS MÉDICAS DE LISBOA

ST-Segment Elevation – Where is the Myocardial Infarction?

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KEYWORDS: ST-segment elevation, Acute myocardial infarction, Acute coronary syndrome, Hyperkalemia, Electrocardiogram (ECG), Differential diagnosis, Emergency medicine

In the emergency department (ED), ST-segment elevation typically prompts immediate investigation for suspected acute myocardial infarction (AMI). However, it is essential to recognize that not all ST-segment changes correspond to Acute Coronary Syndrome (ACS), and a careful, systematic exclusion of life-threatening causes – particularly AMI – remains a clinical priority[1,2,3].

We report the case of a 60-year-old male with a background of dwarfism, renal lithiasis, and bladder neoplasia, who presented to the ED following a syncopal episode. He denied chest pain or dyspnea but reported months-long hematuria, being under regular urological follow-up. On physical examination, he was hemodynamically stable, afebrile, and eupneic. The admission ECG showed sinus rhythm, ST-segment elevation in leads V1-V4, and hyperacute T waves (Figure 1), leading to immediate transfer to the resuscitation area and initiation of ACS workup.

A bedside transthoracic echocardiogram revealed preserved global systolic function and no segmental wall motion abnormalities, suggesting a low likelihood of AMI. Laboratory tests demonstrated hemoglobin of 11.3 g/dL, acute kidney injury (creatinine 2.84 mg/dL), significant hyperkalemia (7.6 mmol/L), and metabolic acidemia (pH 7.398), with normal cardiac injury biomarkers.

Urgent potassium-lowering therapy led to a partial reduction in serum potassium (6.9 mmol/L), without elevation in cardiac markers. A repeat ECG revealed resolution of the ST-segment elevation but persistence of hyperacute T waves (Figure 2). Abdominopelvic CT identified bilateral ureterohydronephrosis. Following dialysis, ECG abnormalities fully resolved, and the patient was referred to Urology for ongoing management of obstructive nephropathy.

This case illustrates a rare presentation of hyperkalemia with ST-segment elevation and underscores the importance of maintaining a broad differential diagnosis. Nevertheless, it is essential to rigorously exclude Acute Coronary Syndrome (ACS) in the presence of ST-segment changes.

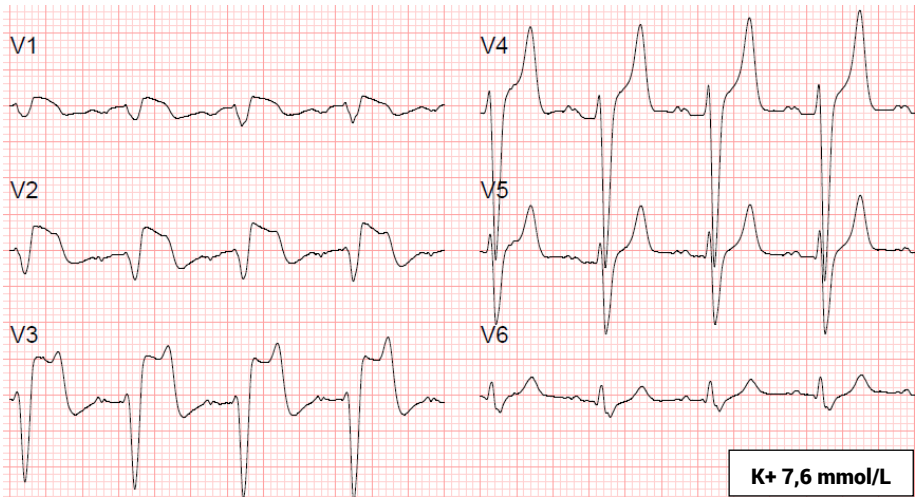

Fig 1. Representation of the precordial leads from the 12-lead electrocardiogram performed at admission to the emergency department, showing ST-segment elevation in leads V1–V4.

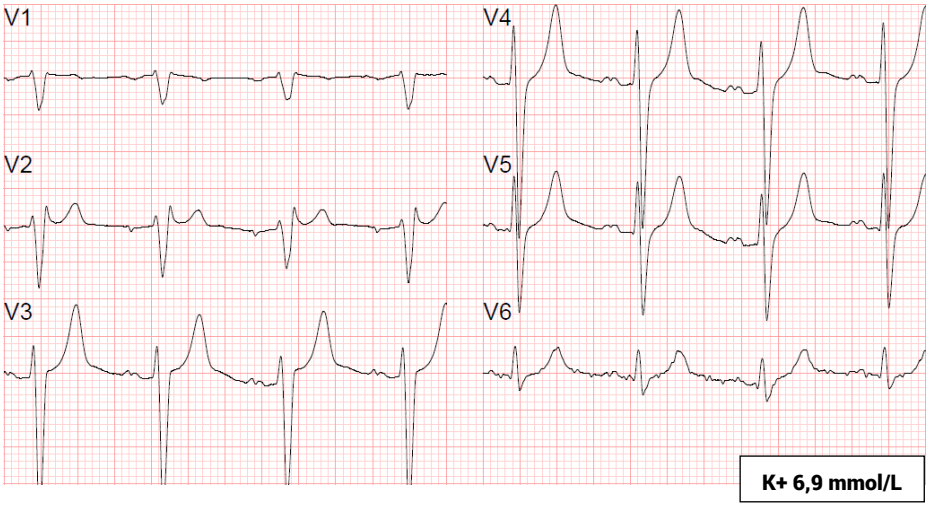

Fig 2. Following emergency potassium-lowering therapy with insulin, hypertonic glucose, and a beta-2 agonist, correction of the ST-segment elevation was observed.

REFERENCES

1. Mattu A, Brady WJ, Robinson DA. Electrocardiographic manifestations of hyperkalemia.Am J Emerg Med. 2000 Oct;18(6):721-9. doi: 10.1053/ajem.2000.7344.PMID: 11043630
2. Durfey N, Lehnhof B, Bergeson A, et al. Severe Hyperkalemia: Can the Electrocardiogram Risk Stratify for Short-term Adverse Events? West J Emerg Med 2017; 18:963.
3. Wang K, Asinger RW, Marriott HJ. ST-segment elevation in conditions other than acute myocardial infarction. N Engl J Med. 2003;349(22):2128-2135. doi:10.1056/NEJMra022580

DISCLOSURE

The authors have no conflict to disclose.

Diplexil R

Valproato Semisódico

CONFIANÇA NUMA VIDA COM QUALIDADE[1,2]

INFORMAÇÕES ESSENCIAIS COMPATÍVEIS COM O RESUMO DAS CARACTERÍSTICAS DO MEDICAMENTO

▼Este medicamento está sujeito a monitorização adicional. Isto irá permitir a rápida identificação de nova informação de segurança. Pede-se aos profissionais de saúde que notifiquem quaisquer suspeitas de reações adversas. Para saber como notificar reações adversas, ver secção 4.8 do RCM.

NOME, COMPOSIÇÃO QUALITATIVA E QUANTITATIVA e FORMA FARMACÊUTICA DO MEDICAMENTO: Diplexil-R 250 mg (269,1 mg de valproato semisódico) comprimidos gastrorresistentes cor de pêssego. Excipiente(s) com efeito conhecido: Amarelo sunset (E110) – 0,2 mg, Sódio: 18,5 mg por comprimido. Diplexil-R 500 mg (538,2 mg de valproato semisódico) comprimidos gastrorresistentes cor-de-rosa. Excipiente(s) com efeito conhecido: Carmoisina (E122) - 0,104 mg, Vermelho de ponceau 4R (E124) - 0,091 mg, Sódio: 37,0 mg por comprimido. **INDICAÇÕES TERAPÊUTICAS:** Epilepsias generalizadas e parciais: Generalizadas primárias: Pequeno e grande Mal, epilepsias mioclónicas; Parciais: simples e complexas. Generalizadas secundárias: síndroma de Lennox-Gastraut, síndroma de West; Formas mistas. Epilepsias especiais: Convulsões febris na criança. Privação do sono. Alterações do comportamento associados à epilepsia. Tratamento de episódios maníacos na doença bipolar quando o lítio está contraindicado/ não é tolerado. Considerar a continuação do tratamento após a ocorrência de episódios maníacos em doentes que responderam ao valproato semisódico na mania aguda. Em: Doentes com ciclos rápidos; bipolares difíceis (idosos e doentes em situações de comorbilidade com abuso de substâncias). - Tratamento profilático dos seguintes tipos de cefaleias: Enxaqueca, Cefaleia Crónica Diária (Enxaqueca Transformada e enxaqueca Persistente e Resistente) e Cefaleia em salvas. **POSOLOGIA E MODO DE ADMINISTRAÇÃO:** Via oral. Se tratamento prévio com Ácido valpróico, iniciar a terapêutica com a mesma dose diária e esquema posológico. Após estabilização do doente poderá instituir-se um esquema posológico de 2 a 3 tomas diárias. A frequência de efeitos adversos (particularmente enzimas hepáticas elevadas) pode estar relacionada com a dose. Avaliar benefício-risco de doses mais elevadas. Concentrações de Fenitoína no sangue podem ser afetadas com aumento de dosagem. Para os doentes que se queixam de irritação gastrointestinal, recomenda-se a administração do fármaco durante as refeições, e aumento gradual da dose a partir de um nível inicial baixo. Epilepsia: dose inicial recomendada:15 mg/kg/dia 3 x dia, com aumentos de 5 a 10 mg/kg/dia em intervalos de uma semana até controlo das crises ou até dose tolerável. A dose máxima recomendada é de 60 mg/kg/dia. Se exceder os 2500 mg, esta deverá ser administrada em doses repartidas. Para a maior parte dos doentes, as concentrações séricas terapêuticas de Valproato situam-se no intervalo de 50-100 mcg/ml. Caso a posologia diária seja igual ou superior a 50 mg/Kg/dia, recomenda-se monitorizar níveis sanguíneos. Episódios maníacos na doença bipolar: Em adultos: A dose diária deve ser estabelecida e controlada pelo médico. Dose diária inicial recomendada é de 750 mg. Em ensaios clínicos, a dose inicial de 20 mg de valproato/kg de peso corporal também demonstrou um perfil de segurança aceitável. A dose deve ser aumentada tão rapidamente quanto possível, de forma a atingir a dose terapêutica mais baixa que produza o efeito clínico desejado. Ajustar a dose à resposta clínica. A dose média diária varia, habitualmente, entre 1000 a 2000 mg de valproato. Se doses superiores a 45 mg/kg de peso corporal, monitorizar. A continuação do tratamento deve ser adaptada individualmente usando a dose mínima eficaz. Em crianças e adolescentes: A segurança e a eficácia de Diplexil-R para o tratamento de episódios maníacos na doença bipolar não foram avaliadas em doentes com idade inferior a 18 anos. Crianças do sexo feminino e mulheres em idade fértil: O valproato deve ser iniciado e supervisionado por um especialista com experiência no tratamento da epilepsia, perturbação bipolar ou enxaqueca. O valproato não deve ser utilizado em crianças do sexo feminino e mulheres em idade fértil a não ser que outros tratamentos sejam ineficazes ou não tolerados. O valproato é prescrito e dispensado de acordo com o Programa de Prevenção do valproato na Gravidez. O valproato deve ser prescrito preferencialmente em monoterapia e na dose eficaz mais baixa, se possível numa formulação de libertação prolongada. A dose diária deve ser dividida pelo menos em duas tomas únicas. Homens: Recomenda-se que Diplexil seja iniciado e supervisionado por um especialista com experiência no tratamento da epilepsia ou perturbação bipolar ou enxaqueca. Cefaleias: A dose mínima eficaz é de 250 mg 2x dia e o tratamento deverá ter a duração mínima de 3 meses. A dose média é de 1000 a 1500 mg/dia. Em doentes com insuficiência renal: pode ser necessário diminuir a dosagem, ou aumentar a dosagem em doentes em hemodiálise. Valproato é dialisável. A dosagem deve ser modificada de acordo com a monitorização clínica do doente. Diplexil-R só deve ser iniciado e supervisionado por um especialista com experiência no tratamento da enxaqueca. O tratamento só deve ser iniciado se outros não forem eficazes ou tolerados e os benefícios e riscos devem ser cuidadosamente reavaliados em revisões regulares do tratamento. **CONTRAINDICAÇÕES:** Diplexil-R está contraindicado nas seguintes situações: - Hipersensibilidade às SA ou excipientes. - Doença hepática ou disfunção significativa. - Antecedentes pessoais ou familiares de hepatite grave, nomeadamente medicamentosa. - Porfiria hepática. - Doentes que tenham doenças mitocondriais causadas por mutações no gene nuclear que codifica a enzima mitocondrial polimerase gama (POLG), por exemplo a síndrome de Alpers-Huttenlocher, e em crianças com menos de 2 anos de idade em que se suspeita de terem doenças relacionadas com a POLG. - Doentes com distúrbios do ciclo da ureia. Tratamento da epilepsia: - Na gravidez, a não ser que não exista um tratamento alternativo adequado. - Em mulheres em idade fértil, a não ser que as condições do programa de prevenção da gravidez sejam cumpridas. Tratamento da perturbação bipolar e profilaxia de crises de enxaqueca: - Na gravidez. - Em mulheres em idade fértil, a não ser que as condições do programa de prevenção da gravidez sejam cumpridas. **ADVERTÊNCIAS E PRECAUÇÕES ESPECIAIS DE UTILIZAÇÃO:** trombocitopénia, alterações da hemostase/coagulação, hiperamonemia com ou sem letargia, alterações nos testes de função da tiroide, insuficiência hepática, muito raramente pancreatites graves, reações adversas cutâneas graves e angioedema. **Programa de Prevenção de Gravidez:** O valproato tem um elevado potencial teratogénico e as crianças expostas ao valproato in utero têm um elevado risco de malformações congénitas e perturbações do desenvolvimento do sistema nervoso. Ver RCM. Foram relatados casos de ideação e comportamentos suicidas em doentes tratados, com medicamentos antiepiléticos, para várias indicações terapêuticas. Não é recomendado o uso concomitante de ácido valpróico/ valproato de sódio com os antibióticos do grupo dos cabapenemos. Doentes com doença mitocondrial conhecida ou presumida: O valproato pode desencadear ou agravar sinais clínicos de doenças mitocondriais subjacentes causadas por mutações do ADN mitocondrial bem como do gene nuclear que codifica a POLG. Se há suspeita de uma deficiência no ciclo enzimático da ureia, devem ser feitos estudos metabólicos antes do tratamento, devido ao risco de hiperamoniemia com o valproato. Poderá ocorrer aumento de peso no início do tratamento. Doentes com uma deficiência tipo II em carnitina palmitoiltransferase subjacente (CPT) devem ser advertidos do risco aumentado de rabdomiólise. Nos insuficientes renais pode ser necessário proceder-se a uma diminuição da dosagem. Excipientes. **INTERAÇÕES MEDICAMENTOSAS E OUTRAS FORMAS DE INTERAÇÃO:** Efeitos do valproato semisódico nos outros medicamentos: Neurolépticos, antidepressivos, benzodiazepinas e barbitúricos; Fenobarbital e Primidona; Fenitoína; Carbamazepina; Etossuximida; Lamotrigina; Zidovudina; Felbamato; Olanzapina; Rufinamida; Propofol; Nimodipina. Efeito de outros medicamentos sobre o valproato de sódio: Antiepiléticos; Mefloquina; Fármacos com ligação elevada às proteínas plasmáticas; Anticoagulantes; Cimetidina ou eritromicina; Fluoxetina; Carbapenemos; Rifampicina; Inibidores de protéase; Colestiramina; Medicamentos que contêm estrogénio; Metamizol; Outras interações: Topiramato ou acetazolamida; Quetiapina; Álcool; Lítio; Clonazepam; Clozapina. Ver RCM. **EFEITOS INDESEJÁVEIS:** Os efeitos indesejáveis notificados mais comuns para o valproato são perturbações gastrointestinais, as quais ocorrem em aproximadamente 20% dos doentes. Têm sido observados casos de lesões hepáticas graves (ou mesmo fatais), especialmente em crianças tratadas com doses elevadas ou em combinação com outros antiepilépticos. Os efeitos indesejáveis foram classificados por ordem de frequência segundo a seguinte convenção: Neoplasias benignas, malignas e não especificadas (incl. quistos e polipos): Raros: Síndrome mielodisplásico. Doenças do sangue e do sistema linfático: Frequentes: Trombocitopenia, leucopenia. Pouco frequentes: Hemorragia. Raros: Anemia macrocítica, macrocitose. Muito raros: Perturbações da medula óssea, concentração reduzida de fibrinogénio e/ou de fator de coagulação VIII, alteração da agregação plaquetária, tempo de coagulação prolongado, linfocitopénia, neutropénia, pancitopénia, anemia ou aplasia da linhagem de células vermelhas. Desconhecido: Agranulocitose. Doenças do sistema imunitário: Pouco frequentes: Angioedema. Raros: Lúpus eritematoso, erupção medicamentosa com eosinofilia e sintomas sistémicos (síndrome DRESS). Desconhecido: Reações alérgicas (ver também "pele e perturbações dos tecidos subcutâneos"), síndrome da resposta inflamatória sistémica. Doenças endócrinas: Raros: Hiperandrogenismo (hirsutismo, virilismo, acne, alopécia com aparência típica masculina e/ ou aumento dos níveis de androgéneos), hipotiroidismo. Doenças do metabolismo e da nutrição: Frequentes: Hiperamonemia, aumento do peso (fator de risco para a síndrome do ovário poliquístico, requer monitorização cuidadosa) ou diminuição de peso; aumento ou diminuição de apetite. Pouco frequentes: Síndrome de secreção inapropriada de hormona antidiurética (SIADH). Raros: Hiperinsulinemia, baixos níveis da IGFBP-1 (insulin-like growth factor binding protein 1), obesidade. Muito raros: Foram relatadas anomalias das provas da função tiroideia, com relevância clínica duvidosa. Hiponatremia. Vasculopatias: Raros: Vasculites. Perturbações do foro psiquiátrico: Frequentes: Agressividade*, agitação*, atenção alterada*. Raros: Irritabilidade, alucinações, confusão, comportamento anormal*, hiperatividade psicomotora*, perturbação da aprendizagem*. * Estas reações adversas são observadas principalmente na população pediátrica. Doenças do sistema nervoso: Frequentes: Sonolência, tremores, parestesias, defeito de memória, nistagmo, torturas. Pouco frequentes: Coma transitório, em alguns casos associado a aumento da frequência das crises, ataxia. Raros: Cefaleias, hiperatividade, espasticidade, estupor, perturbação cognitiva, diplopia. Muito raros: Encefalopatia, demência associada a atrofia cerebral (reversível após a descontinuação do tratamento), distúrbios extrapiramidais p. ex. síndrome parkinsónica (reversível). Desconhecido: Agravamento das crises, sedação, letargia. Afeções do ouvido e do labirinto: Muito raros: Perda de audição (reversível ou irreversível), acufenos. Doenças respiratórias, torácicas e do mediastino: Pouco frequentes: Derrame pleural (eosinofílico). Doenças gastrointestinais: Muito frequentes: Dores, náuseas, vómitos. Frequentes: Diarreia, perturbação gengival (principalmente hiperplasia gengival), estomatite. Raros: Pancreatite (por vezes fatal), hipersalivação, ileus, obstrução intestinal. Afeções hepatobiliares: Frequentes: Alterações nas provas da função hepática. Raros: Lesão hepática grave que inclui insuficiência hepática. Afeções dos tecidos cutâneos e subcutâneos: Frequentes: alopecia, enfraquecimento do cabelo e aparecimento de cabelo encaracolado, alterações nas unhas e leito ungueal. Raros: Exantema, eritema multiforme. Muito raros: Síndrome de Stevens-Johnson, Síndrome de Lyell. Desconhecido: Hirsutismo (por ex. resultante da síndrome do ovário poliquístico), hiperpigmentação. Afeções musculosqueléticas e dos tecidos conjuntivos: Raros: Rabdomiólise. Desconhecido: Foram notificados casos de densidade mineral óssea diminuída, osteopenia, osteoporose e fraturas ósseas em doentes sob tratamento prolongado com valproato. Ainda não se conhece o mecanismo pelo qual o valproato afeta o metabolismo ósseo. Doenças renais e urinárias: Frequentes: incontinência urinária. Muito raros: Síndrome de Fanconi (com acidose metabólica, fosfatúria, aminoacidúria, glicosúria, reversíveis após a descontinuação do tratamento), enurese nas crianças. Desconhecido: Insuficiência renal, nefrite intersticial, deterioração da função renal. Doenças dos órgãos genitais e da mama: Frequentes: Amenorreia, dismenorreia. Raros: Síndrome de ovário poliquístico, infertilidade masculina. Desconhecido: Espermatogénese anormal (com contagem reduzida de espermatezóides e/ou motilidade). Afeções congénitas familiares e genéticas: Malformações congénitas e alterações no desenvolvimento. Perturbações gerais e alterações no local de administração: Raros: Hipotermia, edema. Exames complementares de diagnóstico: Raros: Redução dos fatores de coagulação (pelo menos um), testes de coagulação anormais (tais como prolongamento do tempo de protrombina, prolongamento do tempo parcial de tromboplastina ativada, prolongamento do tempo de trombina, valor de INR aumentado), carência de biotina/biotinidas. População pediátrica: Existe risco particular de lesão hepática grave em bebés e crianças pequenas, especialmente com idade inferior a 3 anos, e de pancreatite em crianças pequenas. Estes riscos diminuem com o aumento da idade. Transtornos psiquiátricos como agressão, agitação, perturbação da atenção, comportamento anormal, hiperatividade psicomotora e transtorno de aprendizagem são observados principalmente na população pediátrica. **Para mais informações deverá contactar o Titular da AIM:** TECNIFAR - Indústria Técnica Farmacêutica, S.A. 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REFERÊNCIAS:

1. Jacoby A, Sudell M, Tudur Smith C, *et al.* Quality-of-life outcomes of initiating treatment with standard and newer antiepileptic drugs in adults with new-onset epilepsy: findings from the SANAD trial. *Epilepsia.* 2015;56(3):460-472. doi:10.1111/epi.12913. **2.** Quante A, Zeugmann S, Regen F, Engelhardt A, Anghelescu IG. Psychopharmacological treatment status in outpatients with bipolar disorder: a clinical survey in Germany. *Psychiatry Investig.* 2010;7(3):155-162.

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JORNAL DA SOCIEDADE DAS CIÊNCIAS MÉDICAS DE LISBOA

The Evolution of Porto Medical School Honour Students' Folders

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ABSTRACT: In the "Maximiano Lemos" Museum of Medical History of the Medical School of the University of Porto (FMUP, 1911) there is a collection of Honour Students' folders that dates back to the time of its predecessor, the Porto Medical-Surgical School (1836–1911). Contrary to what happened with the student attire, the honour students' folders were not included in the institutional rules, a fact that explains the diversity of motifs and materials used. However, the colours of the ribbons and the coating are course-specific and constant over time, as is the symbolism underlying the different representations.

In the past, the beauty of the specimens mirrors the aesthetic taste and affection of the people involved in their idealisation and/or production, even when made to order. They contrast with the simplicity and uniformity of the recent mass-produced folders.

Underlying all the folders are dates, signatures and inscriptions, in prose or in verse, of the masters, fellow students, family and friends, which reflect feelings and highlight the most striking features of each personality.

Honour folders represent one of the oldest traditions of student life and are material proof of the academic community's identity and rejoicing. Their preservation and outreach matter.

KEYWORDS: Honour Folders; Academic Traditions; FMUP History; Museum of History of Medicine "Maximiano Lemos" of FMUP.

THE MUSEUM

The "Maximiano Lemos" Museum of Medical History of the Medical School of the University of Porto (FMUP) opened its doors on 17 October 1933, following an initiative of the University School Board. Previously, in 1925, a medical-historical exhibition, held at the Porto Crystal Palace to celebrate the hundredth anniversary of the former Porto Royal Surgical School (1825–1836), had gathered several items, some of which were later offered to the Medical School by their owners. To this group of items were added other objects held in several School Departments, as well as old medical books [1]. The acquisition and organisation of other documents and instruments was led by Professor Luís de Pina (1901–1971), who in 1930 had concluded a PhD in Medicine and held the chairs of History of Medicine and Professional Ethics [2]. In fact, FMUP's predecessor, i.e., the Porto Medical-Surgical School (1836–1911), had already included the teaching of History of Medicine since 1836 [3].

In 1959–60, the Museum moved to its current location in the building of the Porto Medical School, in the borough of Asprela. Its reorganisation was conducted by Professor Luís de Pina and Assistant Professor Maria Olívia Rúber de Meneses (1932–1990), who succeeded him until her death in 1990. Since this date until 2023, I served as the Director of the Museum and as a lecturer in the History of Medicine and Medical Museology at this Faculty.

The collections were mainly organised according to a chronological order, from ancient to modern times. The Museum contains several important collections for the history of medical science, of great value due to their rarity, quality of execution, and scientific, technological, and technical relevance. The vast estate of the Museum includes paintings, drawings, caricatures, sculptures and jewellery, as well as medical and surgical instruments and devices, and documents.

Since its transfer to Asprela, the Museum has been able to provide graduate and post-graduate medical students with the necessary training, not only to raise awareness about the importance of medical museum studies, but also to teach them the basic skills for the identification, characterisation and classification of medical objects. The history of those objects activates a sequence of medical, historical, scientific, technological and social knowledge, calling for historical contextualisation and evolutionary analysis. In the ambit of pre-graduate training, the Museum has organised guided tours for secondary school students, at the request of those institutions, in order to complement their curricula. Post-graduate training has focused on medical-historical communications in national and international conferences dealing with different medical and surgical fields, as well as the organisation of exhibitions featured within academic and scientific events, the bibliographical supervision of papers and communications written by teachers, medical practitioners and specialists, and scientific and bibliographical support provided to masters' and doctoral dissertations related to the health sciences. Scientific and technological research has always guided the activities carried out in and by the Museum. Through exchange protocols, it has been possible to define lines of research shared with other national and international institutions related to the History of Medicine or to medical museum studies. Since its transfer to Asprela it has met the conditions to be open to the public [4].

Since 2023, the Museum's collections have been stored in an archive, pending their reinstallation in a new exhibition space.

THE HONOUR STUDENTS' FOLDERS

Among the Museum collections, the honour medical students' folders stand out due to their colourful decorations, the diversity of their materials, their aesthetic value and underlying symbolism, depending on who made them—usually the bride, the mother, the sister or a commissioned artist. They belonged to the medical students of the Porto Medical-Surgical School and of the Medical Faculty of the University of Porto and were donated to the Museum by their owners or their families. They were used on special occasions.

The honour students' folders of the Porto Medical-Surgical School clearly show the influence of the traditions adopted by the Portuguese University (1290), based in Coimbra since the mid-16th century. Reading medical journals from the 19th century confirms, in turn, the preference for the French model in Portuguese academia [5].

The honour folders were distinguished from the usual or current folders, which had smaller dimensions and were produced in cardboard coated with paper or silky fabric with cotton or silk ties, of great aesthetic simplicity. Remember that these folders were derived from the cardboard or leather covers that held the student's documents tied with strips of skin or fibre cords and, later, ribbons [6].

The use of honour folders became widespread among Portuguese students in the first half of the 19th century, inspired by these primitive knots.

The **earliest honour folder** in the collection of the "Maximiano Lemos" Museum of Medical History dates to the school year of 1854–55, and the most recent one to 1984–85. Overall, there are twenty-eight. This honour student's folder from the Porto Medical-Surgical School, dated 1854–55, belonged to João Pereira Dias Lebre (1829–1900), who would later hold the chair of Anatomy at this School. It was donated by his grandson, Dr. Mário Caldevilla Paula Santos. It has a velvet-lined cardboard structure, red on one side, yellow on the other. The student's initials are embroidered with silk thread on one side, whereas the other side bears a silver-thread snake entwined around a silver rod, as well as a jar resting on a book—both in silver thread and silk—and a bladed surgical instrument in

silk. The brown colour of the handle recalls the material often used in its manufacture, tortoiseshell, and the grey colour of the carbon-steel blade [7]. The design is surrounded by a floral pattern and a hovering owl. It contains handwritten paper prescriptions. It measures 29,5 × 20 × 1,3 cm [8].

All the folders are rectangular in shape, though the materials used in their production vary considerably.

Yellow and red used to be the colours chosen by the students at the Porto Medical-Surgical School for the fabric covering their folders and for the ribbons hanging from them. The exception to this rule is a folder found in the Museum collection with only yellow ribbons. After this School became the Medical Faculty of the University of Porto (1911), yellow progressively became the colour of choice, although there could be folders featuring both colours in the first years.

Regarding decorations, structures and materials, the earliest folders were mainly made of cardboard lined with silk, or wood partially or fully covered in silk. More recent folders are made of cardboard and leather, some featuring engravings and appliqués. This structure has been maintained since the 1980s, though with a plain design without images but full of inscriptions.

When **fabric** was used in the folders, they were embroidered with silk thread and hair by the students' mothers, fiancées and girlfriends or by order—these decorations were customised and always unique. One side of the folder usually shows more intricate motifs than the other. Most of them include the student's date of graduation, as well as their initials and their first name or signature. **Floral patterns** were extremely common and, although there was wide diversity, the most frequently represented flowers were poppies (*Papaver somniferum*), foxgloves (*Digitalis purpurea*) and morning glories (*Ipomoea*). The preference for these flowers was probably no coincidence, as they all have medical applications—the first two being the sources of opium and digitalis, respectively. From the high number of medicinal plants, these were chosen due to their unique beauty, and the shape and colour of their flowers. One of the folders shows a butterfly and a bee hovering among the flowers, an idyllic scene captured with refined aesthetic sensitivity. All the folders made of fabric feature the **symbol of the medical course**, i.e., a serpent coiling around a cup and a staff or tree trunk. This central motif may be accompanied by a variety of **other figures: a book, a skeleton, the inscription "Galeno", a bird feather, or surgical instruments.**

Throughout history, the serpent has been closely related to Medicine. In Antiquity, for example, the temples in honour of Asclepius treated eye conditions by using a snake on the patient's eyes [9]. It was also one of the ingredients used in theriac, an ancient medical concoction made from several animal, vegetable and mineral substances, widely used for centuries to treat all sorts of maladies [10]. The snake-entwined staff of Asclepius, the Greek god of medicine, remains a symbol of medicine today. In fact, the staff, as a symbol of power, was used by healers in primitive communities [11]. The stylised representation of one or more skeletons was another students' favourite, which completed the dense symbology related to Medicine. Knowledge and the dissemination of medical skills are represented through embroidered designs depicting books and feathers around the symbol of medicine. Only one name among all the figures in the History of Medicine is mentioned on the folders: Galen of Pergamon (c.129 AD–c.217). A physician to gladiators in Rome, Galen is considered a precursor of Claude Bernard (1813–1878), due to his studies in experimental physiology. He also expanded anatomical terminology, and for more than thirteen centuries, Galenic anatomy was regarded as authoritative—any challenge to the Galenic tradition could be punished with death. In Portuguese universities, Galenic medicine was taught until the 18th century, together with Hippocratic medicine and Islamic medicine [12].

We can follow some examples in the collection:

- **An honour student's folder from the Porto Medical-Surgical School, dated 1871–72,** belonged to Joaquim Rodrigues de Carvalho. It has a cardboard structure with red silk outer lining and beige silk inner lining, ornamented with yellow silk ribbons. One side presents an intricate floral pattern embroidered in velvet and silver threads, as well as sequin and strass appliqués around the symbol of medicine (a cup in silver thread next to a snake-entwined staff in silk). Close to this symbol, an open book shows an inscription with the school initials (EMCP), the student's initials (J.R.C.), his graduation date (1871–72), and the school year (4th). There are also two silk-embroidered floral patterns and a white ribbon with the inscription "Galeno". On the other side, the same floral pattern surrounds the student's initials embroidered in silver thread (J.R.C.). It measures 22,7 × 31,5 × 1,5 cm [13].

■ **An honour student's folder from the Porto Medical-Surgical School, dated 1896–97,** belonged to Joaquim da Silva Ramalho. It has a cardboard structure with yellow satin outer lining and grosgrain inner lining with yellow and red satin ribbons. On one side, silk-embroidered floral patterns, including the poppy, surround the symbol of medicine, embroidered with hair (a skeleton rises over Galen's book, holding a torch in its right hand and a staff in its left; next to the book, a snake coils around a cup). The other side shows the student's initials and graduation date ("96–97") embroidered with hair, framed by a silk-embroidered floral design. It measures 31,5 × 22 × 1,5 cm [14]. **(Fig. 1)**

■ **An honour student's folder from the Porto Medical-Surgical School, dated 1897–98,** belonged to António Joaquim de Sousa Júnior (1871–1936), who would later become Professor of Surgery. It was donated by his granddaughter Maria Nazaré Guimarãis Laroze Rocha. It has a cardboard structure with an outer lining in yellow and red satin and an inner lining in beige satin, ornamented with yellow and red ribbons. Using silks of different colours and silver thread, a floral pattern is embroidered on one side, which also features the symbol of the medical-surgical course embroidered with hair (a cup on top of a staff and branches, all entwined by a snake). The other side displays the student's initials (AJSJ) and graduation date ("1897–1898"), embroidered with silver thread. It measures 22 × 30,5 × 2,2 cm [15].

■ **A very special honour student's folder from the Porto Medical-Surgical School, dated 1901–02,** belonged to Manuel Monterroso (1875–1968). This doctor-artist published creative and humorous works in Portuguese and foreign periodicals. He illustrated the works of different authors. This folder was donated by its owner. It has a cardboard structure with yellow silk outer lining and beige grosgrain inner lining, ornamented with grosgrain yellow and red ribbons. One side portrays a domestic scene, entirely embroidered with hair: a seated male figure holds an open book and looks at a skeleton, which is pointing at him with a rod/pencil—both a symbol of medicine and of the plastic arts that stand for the student's wisdom and artistic skills; next to this figure are a Chinese-pattern folding screen, a vase holding a bunch of flowers and a candlestick, and three books on a desk; to the left, a flower bouquet, including poppies and foxgloves, is wrapped by a ribbon inscribed with the name "Monterroso". On the other side, the central design shows a snake-entwined jar; to the left, a line of eleven skeletons holds a plaque bearing the graduation date ("1901/1902"), whereas a bunch of morning glories is found on the right. Inside the folder, an inscription on the upper left corner, next to a silk-embroidered flower design, reads: "To you! ... I entrust my soul. Yours MGRS". Right below is the following handwritten note, dated 1965, by Manuel Monterroso: "Embroidered by Maria da Glória Ribeiro da Silva, when still a bride, using gauze and her own hair, following my own design, which Rafael Bordalo intended to, but could not, author for lack of time, as he admitted in a letter that he sent me, which has been framed and sent to the Amarante Museum, where a room is named after me. A part of my heart is here, as a widower of the adored bride of my youth, who was to become my beloved and never forgotten wife!" It measures 33,5 × 23,5 × 1,5 cm. It is kept in a casing made of wood, glass, metal and fabric (5 × 36,5 × 26,5 cm) [16], [17]. **(Fig.2)**

■ **Two folders** show surgical instruments in combination with the date of graduation. One is the earliest honour folder from **1854–55**, already described, and the other an honour student's folder from the Porto Medical-Surgical School, dated **1910–11**. This folder has a cardboard structure with yellow silk outer lining and beige grosgrain inner lining, ornamented with grosgrain yellow and red ribbons. A dégradé embroidery on one side shows a poppy next to a snake-entwined tree trunk. The other side shows the student's initials ("C A" or "A C." or "G A" or "A G") and the dates 1910 and 1911 embroidered with silver thread and crossed respectively by a pair of scissors and a scalpel. The inscriptions are framed by six urinary catheters. It measures 35,5 × 26 × 1,3 cm [18]. **(Fig.3)**

It is important to note the different **structures and materials** used in these folders, pointing out some examples from the collection.

■ **An honour student's folder from the Porto Medical-Surgical School, dated 1890–91,** belonged to Carlos Alberto de Lima (1866–1958), who would later become Professor of Surgery. It has a **cardboard structure** with yellow silk outer lining and red silk inner lining, ornamented with yellow and red grosgrain ribbons.

Fig 1. Honour student's folder from Porto Medical-Surgical School, 1896-97 [A - front; B - back]

Photograph by Catarina Carrinho (FMUP). "Maximiano Lemos" Museum of Medical History (FMUP).

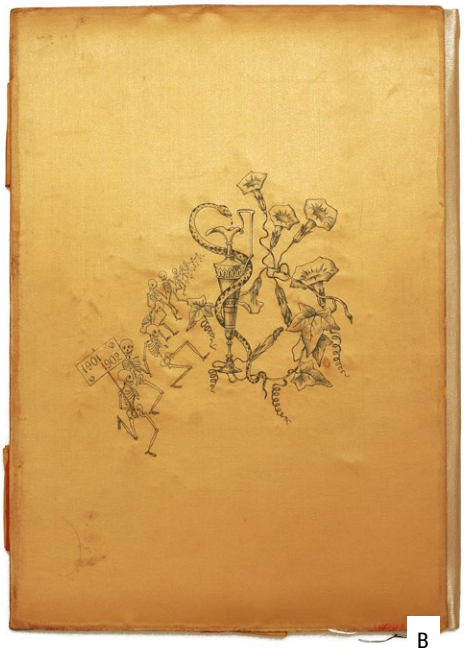

Fig 2. Honour student's folder from Porto Medical-Surgical School, 1901-02 [A - front; B - back]

Photograph by Catarina Carrinho (FMUP). "Maximiano Lemos" Museum of Medical History (FMUP).

One side shows a butterfly and a bee hovering over a floral pattern, as well as the course symbol: a cup on a book, and a snake-entwined staff surrounded by branches. The branches are held by a ribbon embroidered with the initials of the Medical-Surgical School (E.M.C.P.) and the date of graduation ("1890 a 1891"). On the other side, the student's initials (C.A.L.) are framed by a floral pattern. The entire embroidery is made with hair. It measures 33,5 × 23 × 1,5 cm [19].

■ **A senior student's folder from the Porto Medical-Surgical School, dated 1901–02**, belonged to Ângelo Alves de Sousa Vaz. It was donated by Júlio Machado de Sousa Vaz and Bernardino Machado Vaz. It has a **cardboard structure** with yellow silk outer lining and red silk inner lining, ornamented with yellow and red grosgrain ribbons. A floral pattern and the symbol of medicine (book, cup, snake-entwined rod) are painted on one side, together with the date of graduation ("1901–1902").

The student's initials ("AV") and another floral pattern are also painted on the other side. Inside, Professor Júlio Machado de Sousa Vaz's card may be found, with a handwritten note related to the donation of the folder. It measures 32 × 22 × 2 cm [20].

Wood folders usually have the student's initials and signature engraved, together with the date of graduation and floral motifs painted on both sides, mostly poppies. Only one of these folders has ribbons, belonging to Antero Augusto da Cunha Brochado. Though dated 1912–13, when the faculty had already been established, the folder has red and yellow ribbons, which characterised those of the Porto Medical-Surgical School. Inside, the folders are lined with paper or silk, and may contain the date of graduation, signatures, handwritten notes and poems. One of the wood folders used to belong to Tiago de Almeida (1864–1936), who would be a prestigious Professor of Clinical Medicine at this University.

- **The honour student's folder from the Porto Medical-Surgical School, dated 1892–93**, belonged to Tiago de Almeida (1864–1936) and was donated by Professor Pereira Viana. It is a **wooden and velvet** folder lined with paper, containing several handwritten notes from friends and classmates. Two of them read as follows: "Aristotle used to say that three things are necessary to excel in one's profession: nature, study and practice. None of them are lacking in you, you are the glory or my course, you are my glory because you are not only my classmate but my friend" [21]; "My dear Thiago, your (apparent) physical sturdiness is inversely proportional to the strength of your talent. I remain an admirer of your talent, your energy and the kindness and generosity of your heart. Your classmate and most loyal friend, Fran.co H. de Magalhães Pesqueira – Sarzedinho" [22]. It measures 30 × 20 × 3 cm [23].

- **Another honour student's folder from the Porto Medical-Surgical School, dated 1908–09**, has a **wooden structure** with red and yellow silk lining, and red and yellow grosgrain ribbons. One side shows a silk-embroidered poppy bouquet, as well as a silver monogram bearing the initials A and C, or G. A silk-embroidered bunch of maidenhair fern is placed above the date of 1909, embroidered with hair. It measures 31,5 × 22,5 × 2,12 cm [24].

- **The honour student's folder from the Porto Medical-Surgical School**, belonging to Antero Augusto da Cunha Brochado, already mentioned, is a **wooden** and silk folder with paper inner lining. It has four red and yellow grosgrain ribbons. The student's initials and signature are engraved on one side. A poem, dated "25-XI-912", is written on the paper lining, as well as several classmate signatures. It measures 30,5 × 21 × 1,8 cm [25].

- **An honour student's folder from the Medical Faculty of the University of Porto, dated 1912–13**, was donated by J. Castelo Branco e Castro in 1957. It is a **wood** and red velvet folder with silk lining, ornamented with yellow grosgrain ribbons. Poppy flowers are painted on one side, whereas the other side shows the student's initials and graduation dates, framed by a floral pattern. Inside, two dates are painted on the silk lining— "13-VII-1912" and "26-VII-1912". It measures 23,4 × 33,8 × 2 cm. The folder is kept in a wooden and metal casing (4,5 × 38 × 28 cm), bearing its owner's initials and the symbol of medicine (cup, snake, book and feather) on the upper left corner. Dr. J. Castelo Branco also donated a cardboard desk folder, with black silk outer lining and beige silk inner lining. A bouquet of yellow roses is painted on the inner lining, as well as a snake-entwined staff and cup resting on a book. In one of the corners, the owner's initials are engraved in silver. It contains a list of topics included in several medical examinations throughout his studies [26]. **(Fig.4)**

Leather folders have appliqués, mostly silver, bearing the student's initials, first surname and date of graduation. Floral motifs are also common. The symbol of medicine (the snake and the cup) on the silver appliqués may be found in three folders, as well as a signature in gold. Joaquim Maia's folder (1922–2008), who would become Professor of Hygiene and Social Medicine, had belonged to his father, as may be seen in the two dates (1919 and 1945) engraved on the silver appliqué. Inside, a floral pattern is embroidered with silk thread. All leather folders have ribbons, mostly yellow. However, the folders of Jorge Azevedo Maia (1886–1931) and Hernâni Bastos Monteiro (1891–1963), who graduated in 1912–1913 and 1914–1915, and who would become Professor of Medical Pathology and Professor of Anatomy and Director of the Institute of Anatomy respectively, combine red and yellow ribbons, as was the tradition of the Porto Medical-Surgical School.

Fig 3. Honour student's folder from Porto Medical-Surgical School, 1910-11 [A - front; B - back]
Photograph by Catarina Carrinho (FMUP). "Maximiano Lemos" Museum of Medical History (FMUP).

Fig 4. Honour student's folder from the Medical Faculty of the University of Porto,1912-1 3[A - front; B - back]
Photograph by Catarina Carrinho (FMUP). "Maximiano Lemos" Museum of Medical History (FMUP).

■ **An honour student's folder from the Medical Faculty of the University of Porto, dated 1912–13,** belonged to Jorge de Azevedo Maia (1886–1931), who, as noted, was later a Professor of Medical Pathology. It was donated by his daughters Berta Azevedo Maia Luizello and Maria Emília Azevedo Maia. It has a **leather** folder with silver appliqués and yellow silk lining. It is ornamented with yellow and red grosgrain ribbons. A floral pattern is engraved on one side, together with two silver appliqués bearing the student's initials and date of graduation. The symbol of medicine is engraved on the other side (a snake-entwined winged staff). It measures 34,3 × 25 × 2 cm. It is kept in a cardboard casing (3 × 35,5 × 26,5 cm) [27].

Fig 5. Honour student's folder from the Medical Faculty of the University of Porto,1926-27
Photograph by Catarina Carrinho (FMUP). "Maximiano Lemos" Museum of Medical History (FMUP).

■ **The honour student's folder from the Medical Faculty of the University of Porto, dated 1918–19 and 1944–45,** belonged to Celestino da Costa Maia and later to his son Joaquim Maia (1922–2008), as noted, who became Professor of Hygiene and Social Medicine. It is a **cardboard and leather** folder with inner satin lining and yellow grosgrain ribbons bearing signatures. On one side there are two silver appliqués: one, in the upper left corner, bears Joaquim Maia's initials, while the other, in the lower right corner, shows the dates "918–919" and "944–945". The inner side of the cover shows a dégradé embroidery of a floral pattern. It measures 21,5 × 33 × 2,2 cm [28].

■ **An honour student's folder from the Medical School of the University of Porto, dated 1926–27,** belonged to Luís José de Pina Guimarães (1901–1972), who would become Professor of History of Medicine and of Professional Ethics, and the founder of the "Maximiano Lemos" Museum of the History of Medicine. It is a cardboard and leather folder lined with satin. The yellow grosgrain ribbons bear several signatures. One side features two silver appliqués—the tympanum of a Greek temple bearing the inscription "Asclepios", and the symbol of medicine (snake and cup). His signature is engraved in gold letters. Two inscriptions on the inner silk lining read as follows: "Graduation: 23.7.927" 1 and "Maria de Lourdes-24 March 1927" 2. It measures 33,5 × 23,5 × 2,5 cm [29]. **(Fig.5)**

Since 1980, all honour medical students' folders have been made in **black leather**, lined with yellow satin. They have yellow grosgrain ribbons and no appliqués. They are distinguished from one another according to their handwritten notes. The folders dated 1979–80 and later were donated to the museum by the respective medical class and contain all the graduates' signatures. Regardless of its material, the folder may bear no relevant information but usually contains signatures and handwritten notes by classmates and friends, as well as inscriptions, prescriptions, dates of graduation, poems and floral designs.

One of these is **the folder of the Medical Class of 1979–1985**, donated by this Medical Class—my medical class—which this year celebrates its 40th anniversary and to whom I pay my respects. It has a cardboard structure with outer leather cover, yellow silk inner lining, and is ornamented with yellow grosgrain ribbons. It contains the graduates' signatures. It measures 34 × 24,5 × 2 cm [30]. **(Fig.6)**

CONCLUSION

Safeguarding, investigating and disseminating knowledge about medical heritage is of extraordinary importance, as it constitutes an undeniable contribution to knowledge about the History of Medicine. It is important to promote within our faculties specialised training in this field in direct relation with their organic units and museums—public and private, national and international—owners of medical heritage, in order to create synergies that promote knowledge and development.

The study of the Honour Folders of the students of the Medical-Surgical School of Porto and the Faculty of Medicine of the University of Porto revives the

Fig 6. Honour student's folder from the Medical Faculty of the University of Porto,1984-85
Photograph by Catarina Carrinho (FMUP). "Maximiano Lemos" Museum of Medical History (FMUP).

history of student life developed in these institutions, which are marked by contemporary foreign influence and the timeless values of Greek and Roman Medicine, evident in the symbolism of the chosen graphics. Underlying the personalised message of each cover is the complexity of its execution and its aesthetic beauty, conveying an art and a taste of the time.

BIBLIOGRAPHY

1. Pedro Vitorino, Alberto Saavedra, Catálogo da Exposição Retrospetiva de Medicina (Porto: Emp. Industrial Gráfica do Porto, 1925), 11-101.
2. Amélia Ricon Ferraz, "Balada de Despedida do 5. Ano de 1924-1925 da Revista de Costumes Médicos "Onde lhe doe?" Arquivos de Medicina 19,4 (2005): 135-
3. Hernâni Monteiro, Evolução do ensino da História da Medicina na Escola do Porto (Porto: Tip. Enciclopédia Portuguesa, 1932), 3-21.
4. Amélia Ricon Ferraz, Catálogo do Museu de História da Medicina "Maximiano Lemos" da Faculdade de Medicina da Universidade do Porto. (Lisboa: Círculo Médico, 2000), 7-11.
5. Maria C. Burguete, Décio Martins, Carlos Fiolhais, Evolução dos estudos em Coimbra no século XIX: contribuição das ciências físico-químicas (Coimbra: Imprensa da Universidade de Coimbra, 2013),167-191.
6. Artur Ribeiro, Pastas Académicas. Exposição – Roteiro. (Coimbra, 2008), 5-8.
7. Amélia Ricon Ferraz, Uma análise da estrutura e forma dos instrumentos cirúrgicos. O contributo português desde o séc. XVII ao séc. XX. (Porto: Medisa, 1996), 44-50;65-67.
8. Amélia Ricon Ferraz, Inventário do Museu de História da Medicina "Maximiano Lemos" da Faculdade de Medicina da Universidade do Porto. (Vila Nova de Gaia: Victor Moreira – design & produção gráfica, 2003), 324.
9. Arturo Castiglioni, História de la Medicina. (Barcelona: Salvat Editores, 1941),75,78,121,193.
10. Arturo Castiglioni, História de la Medicina. (Barcelona: Salvat Editores, 1941), 353-354
11. Amélia Ricon Ferraz, Inventário do Museu de História da Medicina "Maximiano Lemos" da Faculdade de Medicina da Universidade do Porto. (Vila Nova de Gaia: Victor Moreira – design & produção gráfica, 2003), 46.
12. Maximiano Lemos, História da Medicina em Portugal. Doutrinas e Instituições, Vol II (Lisboa: Manuel Gomes Editor, 1899), 245-262.
13. Amélia Ricon Ferraz, Inventário do Museu de História da Medicina "Maximiano Lemos" da Faculdade de Medicina da Universidade do Porto. (Vila Nova de Gaia: Victor Moreira – design & produção gráfica, 2003), 323.
14. Idem, Ibidem.
15. Ibid., 324.
16. Amélia Ricon Ferraz, A Real Escola e a Escola Médico-Cirúrgica do Porto-Contributo para a História da Faculdade de Medicina da Universidade do Porto. (Porto: UPorto100,2013), 579-587.
17. Amélia Ricon Ferraz, Inventário do Museu de História da Medicina "Maximiano Lemos" da Faculdade de Medicina da Universidade do Porto. (Vila Nova de Gaia: Victor Moreira – design & produção gráfica, 2003), 323.
18. Ibid., 322
19. Idem, Ibidem
20. Ibid., 323
21. Ibid., 325
22. Idem, Ibidem
23. Idem, Ibidem
24. Ibid., 323
25. Idem, Ibidem
26. Idem, Ibidem
27. Ibid., 324
28. Idem, Ibidem
29. Idem, Ibidem
30. Ibid., 325

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JORNAL DA SOCIEDADE DAS CIÊNCIAS MÉDICAS DE LISBOA

Assessment methods in Undergraduate Medical Education: brief considerations

Part of the content presented in this article is drawn from the Pedagogical Report of the Aggregation Examination in Medicine (Neurology), conducted at the Faculty of Medicine, University of Lisbon (May 2025).

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ABSTRACT: Student assessment is an integral part of a medical curriculum. One of the main objectives is to verify whether students meet the standards of knowledge and performance that allow them to progress to subsequent levels of learning. To achieve this aim, assessment methods must be developed in accordance with the learning objectives defined for the stage at which students are at the time of assessment.

For the assessment of a medical student to be complete, it is necessary to use various methods to evaluate different crucial competencies: knowledge, clinical skills, and attitudes. This paper reviews the best known or most frequently used tools for each of these competencies, such as written or oral assessments, multiple-choice tests with particular emphasis for single best answer (SBA) questions, direct observation in learning environments, objective structured clinical examinations (OSCE), and the use of portfolios. The use of simulation is addressed in various assessment contexts. A brief description is provided of global assessment scales, tools that confer objectivity and validity on assessments and improve reproducibility among assessors. The most important properties that an assessment must fulfil in order to be useful are described. Particular importance is given to psychometric criteria such as validity, reliability, feasibility and acceptability.

Whether for formative or summative purposes, student assessment is an essential step in the learning process. The analysis of the results of the various assessments should guide medical schools in optimising teaching and learning processes. For students, it should contribute to their self-learning, so that they can play an active role in the process of their own improvement.

KEYWORDS: Medical education; Assessment; Evaluation; Knowledge and Skills

INTRODUCTION

Student assessment is an integral part of a medical curriculum. One of the fundamental objectives of assessment is to verify whether students meet the standards of knowledge and performance that allow them to progress to subsequent levels of learning. Another relevant attribute is that, through the exposure of learning objectives, students identify the areas of the course that are considered important, which motivates study and improvement in essential areas. On the other hand, following the assessment results, students receive information about their performance, weaknesses, and ways to improve. Additionally, and of interest to faculty, it can measure the effectiveness of teaching and identify weaknesses in the curriculum or its implementation.

Until around 1950, knowledge and clinical skills were essentially assessed through written or oral exams. The questions on written exams were often open-ended, and were often corrected in a very subjective manner. Oral examinations typically involved an interview and observation of a patient, followed by a discussion with the assessors, who scored the student's performance and questioned them on aspects considered relevant. [1] This type of assessment had several weaknesses, related to subjectivity in the evaluation of the exams, heterogeneity of the evaluators and the patients, and the long time required for its implementation.

From the 1950s to the present day, we have witnessed several changes in the way medical education is assessed. [2] Three types of factors have contributed to this. The first factor was the development of new assessment methods, with the aim of measuring the different areas of competence of a future doctor. Examples of these new methods include the introduction of multiple-choice tests, the use of structured clinical examination stations known as OSCE (Objective Structured Clinical Examination), the use of simulation environments with actors (standardized patients), and other techniques to assess non-cognitive skills, such as communication or professionalism.[3] A second factor was the increasingly widespread adoption of computers as an integral part of assessment. In addition to their central role in the construction and administration of multiple-choice tests, computers provide important support in the process of obtaining scores and analysing assessment metrics. Furthermore, computers and new digital technologies have been increasingly explored for their potential to create simulation environments, generating realistic clinical scenarios in which students can be assessed without subjecting real patients to this type of evaluation. The third factor that has contributed to the change in the assessment relates to the development of research in Medical Education, with increasing research on the psychometric principles that assessments must comply with, and the identification of various types of faults in assessment processes and proposals for their reduction. [2,4]

This paper reviews several methods of assessing undergraduate students for the different skills that a doctor must have (knowledge, skills, and attitudes), and the most important psychometric properties that these instruments must fulfil in order to be fair and accurate.

1. ASSESSMENT METHODS

> "*No single assessment method can provide all the data required for judgment of anything so complex as the delivery of professional services by a successful physician*"
> (Miller, 1990) [5]

For an assessment to fulfil its function properly, it is first necessary to know and define what is to be assessed. Thus, even before defining the assessment methods and instruments, it is important to define the learning objectives: knowledge, clinical skills, procedures, and attitudes that students must demonstrate in order to be considered competent for the curricular level at which they are studying. The selection of methods and construction of assessment tools should focus on the assessment of these endpoints to be achieved. The objectives must be clear, such as what type of task the student should be able to perform, the conditions under which that task should be required, and the level of performance considered acceptable. The definition of objectives must be precise and specific to ensure the quality of the assessment. [6]

Learning objectives are broad and complex, and it is difficult for a single tool to analyse all the areas in which students should be evaluated. Therefore, it is mandatory to use several assessment methods in order to achieve an accurate and comprehensive assessment.

In brief, there are three types of competencies that should be assessed: knowledge, skills, and attitudes. Knowledge refers to theoretical information of the curriculum that must be learned and understood;

skills refer to the ability to perform tasks, such as taking a medical history, performing a physical examination or a technical procedure; attitudes refer to professional qualities that are essential for a future doctor, such as communication skills, sense of responsibility, ethics, and empathy. Once the learning endpoints for these several competencies have been defined, different forms of assessment can be developed for the various fields to be tested. Importantly, to be more successful in achieving these endpoints, students should be informed of the learning objectives.

There is currently a wide variety of assessment tools: essays, projects, reports, patient problem management, short-answer questions, multiple-choice questions, rapid clinical case assessment, OSCE, checklists, rating scales, portfolios.[7] These instruments can be used in a complementary way, with some mainly assessing knowledge and cognitive processes, and others assessing technical skills or attitudes. Below, we describe the best known or most frequently used ones.

1.1. Tools for assessing knowledge

Written assessments are likely the most commonly used methods in medical education. They are relatively easy to conduct in terms of human resources and costs. They are used to assess knowledge, clinical reasoning, problem-solving, and decision-making skills in specific clinical scenarios. However, they are not suitable for assessing other curricular competencies, such as clinical skills, attitudes, or professionalism. Oral assessments can also be used to test knowledge and clinical reasoning, but they are rarely used because they are time-consuming, somewhat subjective, assess only limited aspects of the curriculum, and are subject to various biases, which can lead to inaccurate or poor reliable ratings.

There are several types of written assessments. One of these is the use of open-ended questions, in which students must produce a spontaneous response. These include short-answer questions, in which students must respond with two to three words, or questions that require longer answers, or even broader responses such as essays. Alternatively, closed questions can be used. In this type of questions, students are asked to select answers from a list of options. Examples of closed questions are: true/false questions, in which students must categorize the answer options as true or false; multiple-choice questions, also known as single best answer (SBA) questions, in which the student must select the most correct option from a group of alternatives; multiple true-false questions, in which the candidate can choose more than one option.[8]

It has increasingly been advised to use written assessments with closed questions, as they are logistically easier to apply and rate. Within these, it has been proposed to abandon true or false questions and give preference to single-best-answer (SBA) questions.[9] The SBA question is composed of three parts: the stem (e.g., a clinical case presentation), the lead-in question, and the options, in which one is "the most correct" among three to five distractors.[9] When properly constructed, multiple-choice questions allow for the assessment of not only knowledge of specific content, but also other characteristics such as the ability to interpret, synthesize, and judge in concrete clinical scenarios.[10] In other words, they entail the use of complex cognitive processes that replicate clinical practice.

SBA questions take time and effort to be constructed in order to allow for a valid and fair assessment of students. [11,12] This type of assessment, however, has the great advantage of being able to examine a large number of students in a short period of time, i.e., they meet feasibility and cost-effectiveness requirements. For example, they are the type of questions currently used in Portugal in the National Access Test (PNA) required for doctors to access a specialist training position. (Despacho nº. 4412/2018, de 04 de maio).

Regardless of the method used to assess knowledge, the overall quality of an assessment test depends on the quality of the individual questions (items). Several features should be considered when evaluating the quality of items: the relevance of the items; the alignment between the curriculum objectives and the content of the items; the level of difficulty; the ability to discriminate between students based on their level of knowledge; and student feedback.

1.2. Tools for assessing skills and attitudes

> *"Competence is contextual, reflecting the relationship between a person's abilities and the tasks he or she is required to perform in a particular situation in the real world"*
> (Klass, 2000) [13]

The most appropriate tool for assessing the performance of students with patients should ideally be applied in real situations with supervision and obser-

vation of performance over a specific period of time. It can be carried out in learning environments, where it has adequate apparent validity. However, it may entail several limitations, such as a lack of standardization among assessors, the influence of the clinical contexts in which it occurs, the restriction of the skills being evaluated, and the number of hours required to obtain valid assessments. This format of direct student observation is commonly carried out in continuous assessments, using global performance grids or scales (see below). It can focus on clinical skills, communication skills, teamwork, presentation skills, work habits, and organization. Theoretically, there are several possible types of evaluators: teachers, hospital staff, patients, colleagues, and self-assessment. These observations can be recorded in reports, checklists, or rating scales.[14,15]

When this longitudinal assessment in a real-world setting is not feasible, other formats of direct and standardized observation of students can be used. Examples include long case exercises or mini-clinical evaluation exercises (mini-CEX). [16,17] In these assessment formats, students can be observed while performing certain tasks, such as taking a medical history and performing a physical examination, for a period of 10 to 20 minutes. After that, the students are expected to present a diagnosis and treatment plan, and faculty members evaluate, discuss, and provide educational feedback. This direct observation of students can be combined with exercises that students perform after contact with patients, such as oral case presentations or written exercises that assess reasoning. Videos of encounters with patients can also be used, with the great advantage of evaluating and providing feedback on students' performance in clinical interactions. These approaches are suitable for assessing communication and technical skills, but they are selective in the skills and attitudes they analyse, require time, and are not feasible for evaluating a large number of students.

Due to various difficulties and limitations in the use of real patients for assessment, simulated patients (standardized patients) are increasingly being used. These are actors trained to assume the role of a patient, giving a consistent history, in a specific style of communication and physical findings. Interactions with standardized patients should be adapted to meet specific educational objectives. Standardized patients are often integrated into Objective Structured Clinical Examinations (OSCE). This type of assessment was introduced by Harden and Gleeson, and consists of a series of timed stations, each focused on a different task. [18] Each student must rotate through each station for about 5-10 minutes, where they are challenged with a clinical scenario in which they must demonstrate specific skills and attitudes. A hallmark of the OSCE is that each student must perform the same sequence of tasks and be rated using a standardized scheme. Faculty members use a checklist of specific skills and attitudes, or an overall rating form to assess student performance. [19,20]

Over the years, OSCE have been adapted to integrate assessments of multiple skills: communication, physical examination, interpretation of diagnostic tests, technical skills. The use of simulation models has broadened the possibilities for assessing some more complex skills. [21]

One issue to consider regarding the validity of the OSCE is its ability to assess performance-based skills. The greater the number of stations, the greater the reliability of the assessment. An OSCE with 25 stations over 8 hours may result in excellent reliability, but it is not realistic for most universities, raising issues of feasibility. For this type of assessment to be highly reliable, it has been suggested that it should comprise at least 10 stations. [22]

There are certain procedures and techniques that are difficult or even impossible to test on real or simulated patients. Examples of these include collecting venous or arterial blood, emergency procedures, and surgical techniques. To evaluate these practical procedures, simulations involving sophisticated models are increasingly being used. In fact, simulation is increasingly seen as an important learning aid and can be useful in assessing knowledge, technical procedures, and even teamwork skills.

It should be noted that there is no evidence that a student's performance in an OSCE or simulation environment is predictive of their performance with a real patient. In fact, it has been shown that a student's performance in real life is worse than in simulated environments. [23] Therefore, the use of other methods to assess student's skills and attitudes in the real work environment is justified. The use of diaries, portfolios, or logbooks can be additional tools that reveal what the student has seen or done. They do not replace direct observation of the student, but they can be quite informative.

1.3. Portfolios

A portfolio is a collection of a student's work, which includes documentation and reflections on specific areas of competency, and helps to demonstrate their progress and expertise. It can cover different learning materials, such as records of patients, tasks performed or observed, learning about diseases, literature research, and projects for self-improvement.

Portfolios are useful for demonstrating the acquisition of knowledge, skills, activities, attitudes, and progress over time. They often include self-assessments and learning plans. Although they are most commonly used in formative assessment, they can also be used for summative assessments.

One of the most relevant characteristics of the portfolio is that it leads to self-reflection, revisiting the learning experience to extract the maximum amount of teaching from it. This self-reflection can be extremely useful for promoting self-learning, personal and professional development, and refining practice. [24]

The process of assessing a student through a portfolio comprises several steps: analysis of the learning collection; analysis of reflection on learning, steps that the student took to complement it; assessment of what the student actually learned and accomplished, in relation to the learning objectives; discussion with the student about the evidence of learning; and finally, assessment rating.

There are potential advantages to using portfolios as summative assessment: students demonstrate the scope and depth of the content they have observed; they do so continuously over time; they demonstrate professionalism in achieving learning endpoints; they indicate self-reflection and self-learning; and they allow student's expression of creativity and identity. However, there are issues limiting their use as summative assessment: irregular collaboration by students in completing portfolios; variability among evaluators; and time required for proper analysis. It is therefore essential to decide on the purpose of using portfolios: as a tool for formative or summative assessment. If it is decided that it should be a summative assessment tool, specific objectives should be defined for assessing students: endpoints to be achieved; definition of portfolio content to verify the achievement of learning objectives; activity scoring system; criteria and scales for standardized grading by examiners.[25]

2. GLOBAL ASSESSMENT SCALES

These scales are extremely useful for assessing skills and attitudes that cannot be measured in written tests. They are used to assess clinical skills, technical procedures, communication or other skills related to professionalism. They can be used while observing the student's performance or by recalling their interventions, for example, in practical classes. One of the objectives of using rating scales is to reduce the heterogeneity of classification between different assessors.

Two types of scales are commonly used for quantifying student's performance: rating scales anchored by behavior and Likert scales. Rating scales anchored by behavior were introduced in 1963 by Smith and Kendall. [26] They are constructed based on expected behaviors considered to be "anchors" in the domain under study. Assessors evaluate students by scoring their behaviors on a scale from the lowest to the highest value. Establishing specific behaviors for classification gives the classification a higher degree of accuracy in relation to performance. The number of points on the scale is determined by the number of "anchors" and the evaluator's ability to discriminate between the points on the scale. In some cases, the scale can be grouped into three or more anchors, with more than one point assigned to each, which allows for greater flexibility in the evaluation. Likert scales were developed in 1932. [27] They can take various forms: evaluation (poor-excellent), frequency (never-always), agreement (agree-disagree). A numerical value is assigned to each category. Points on the scale are assigned from the lowest to the highest value. Examiners score skills and attitudes on a continuous scale, for example from "poor" to "excellent."

These scales are easy to develop and apply. However, some flaws can interfere with the validity or reproducibility of the scales. [28] One of these is the "halo effect," in which the examiner is influenced by some characteristics of the student, and consistently scores different aspects of the assessment at the same point on the scale. Another error is the "central tendency," in which the examiner tends to avoid extreme scores. Another problem that can interfere with the validity and reliability of the assessment depends on the examiner, who may be excessively or insufficiently demanding, depending on their expectations of the performance that the examinee should demonstrate. One such error is the "contrast error," where examiners who are exceptionally competent in an area tend to score students lower than other assessors. One way to analyse these

kind of discrepancies is through inter-rater agreement analysis. An effective way to reduce potential errors is through assessor training. Limitations are also minimized through the participation of multiple examiners, for example in OSCE or continuous assessments.

Global assessment scales can be supplemented with checklists. In certain circumstances, it is appropriate to record the performance of specific procedures or tasks. In such cases, a checklist can be used for the various behaviors that the student must exhibit when solving a specific problem. In these circumstances, the assessor scores whether or not the student completed the procedures or tasks that were required. This type of assessment is common in OSCE and continuous assessments. They are objective, quick to carry out, and can be standardized for assessing all students. One drawback is that they do not provide information on the quality of the task performance, which means that they should only be used to evaluate procedures that do not require an assessment of the quality with which they are performed.

3. SELF-ASSESSMENT

"*Self-assessment may be regarded as a skill and, as such, needs to be developed*"
(Falchikov & Boud, 1989) [29]

Lifelong learning requires not only the ability to work independently, but also to assess one's own performance and progress. In medical education, self-assessment refers to the involvement of students in making decisions about their learning, particularly regarding the acquisition of their performance and achievements. Self-assessment is formative in that it contributes to the learning process and helps students to focus on specific areas that require improvement. Rather than simply receiving assessments from external sources, students are encouraged to become aware of their own development and progress.

The self-assessment process may include aspects such as performance review and identification of strengths and weaknesses. Any form of evaluation can be used for self-assessment, provided that the student is confronted with the "gold standard" criteria against which they can compare themselves. It can result from multiple-choice tests and OSCE, once they have access to feedback. Portfolios or logbooks are very comprehensive methods of self-assessment, requiring a high level of self-assessment of several types of performance. There is not always an overlap between the level of performance estimated by students and that identified by the Faculty, which is a very interesting area of research, particularly to understand the reasons for these discrepancies and to what extent the reasons for these discrepancies can help to identify specific pedagogical interventions.

4. PROPERTIES OF THE ASSESSMENTS

Van Der Vleuten described five criteria for determining the usefulness of a specific assessment method: validity (whether the assessment measures what it claims to measure), reliability or reproducibility (the degree to which the measurement is accurate and reproducible), impact on future learning and practice, acceptability (to students and institution), and costs (to the student and institution).[30] For an assessment tool to be useful and fair in evaluating student performance, it must meet these criteria as much as possible.

4.1. Validity

Regardless of the assessment tool, it must be valid for measuring the task for which it was designed. There are several types of validity: content validity, concurrent validity, predictive validity, construct validity, and face validity. [7,30] Some of these forms of validity are more decisive in the context of student assessment. Perhaps the most important in undergraduate assessment is content validity. Content validity refers to the accuracy with which a test assesses content that is included in the learning objectives. In addition to ensuring the validity of individual items (questions about learning objectives), it must also ensure "sampling validity," which means that a test should include a representative sample of the different learning objectives.

Concurrent validity involves demonstrating that the scores on one test correlate with the scores on another test that was constructed previously and administered after the new test. Predictive validity refers to the ability of a test to predict future performance. Construct validity refers to the degree to which a test assesses the underlying theoretical construct it is supposed to measure. Apparent validity is determined by the feedback received from students on whether the test seems valid to them.

There are several factors that reduce validity and should be identified: vague instructions to students, overly complicated vocabulary, a small number

of questions (poor sampling validity), insufficient time for assessment, items that are too easy or too difficult in relation to the learning objectives, and topics that are inappropriate for the learning objectives.

4.2. Reliability

Reliability, or reproducibility, is the degree to which the instrument measures what it is supposed to measure in an accurate, consistent, and reproducible manner. There are several ways to test reliability. [7,30] The internal consistency of a test can be calculated by dividing the test into two parts and analysing the agreement between the two sets of scores. This has the advantage of being calculable with only one test, and is more reliable when the test has a larger number of items. There are several statistical techniques for calculating the internal consistency of a test, the best known being Cronbach's α and KR20. Another form of reliability refers to intra- or inter-examiner reliability. This type of concern is particularly relevant when the assessment requires some degree of subjectivity. In such cases, it may be appropriate to calculate the agreement between evaluators.

There are other ways to check reliability, but they need a number of different tests. To see how consistent a test is over time (test-retest), the same test is given to the same group of students at two different times. Another way to test reliability is by using essentially similar tests, in which modifications are made to the initial test without changing its essential objectives, and applying the second test to the same students to assess the consistency of the scores between the two tests.

There are some factors that increase reliability: the size of the assessment and objectivity in scoring. There are errors that reduce reliability, such as mistakes in scoring, generalization, or bias in student assessment.

4.3. Feasibility

The development of an assessment should take into account the availability of human resources, space, time, and costs. Efforts should be made to find the greatest number of assessments that can evaluate the different components of competence: knowledge, skills, and attitudes. Several questions should be asked to support the various selections: how long does it take to develop the instrument? How long does it take to be completed? How will the scores be interpreted? Is it practical to implement? Is it beneficial for students?

5. FORMATIVE OR SUMMATIVE ASSESSMENT

The type of assessment to be implemented will depend on two types of approach: formative and summative. Formative assessment focuses on guiding students in their learning process, providing reassurance, and promoting self-reflection. This type of assessment, which is highly valued by students, is extremely important provided that it is followed by an intervention program. Summative assessment allows for a general judgment to be made about competence and aptitude for practice. In other words, students are assessed to decide whether they have the minimum qualifications to proceed to the next level. A distinction must be made between assessments that are only suitable for formative use and those that have sufficient psychometric rigor for summative use.

If the aim is to identify students' qualifications, ensuring that they are qualified to proceed to the next level, it is advisable to use summative assessment methods. Summative assessments may not provide feedback. However, summative assessment can influence learning as students tend to study what they know will be assessed. A summative assessment process can also have a formative component if it provides feedback to students on their performance. This learning experience can be stimulating and appreciated by students.

CONCLUSIONS

Whether for formative or summative purposes, student assessment is an essential step in the learning process. Each medical school must identify the most appropriate methods for assessing students for the various learning objectives: knowledge, skills, and attitudes. For those methods to be useful and fair, they must be developed and continuously improved to fulfil criteria such as validity, reliability, acceptability and feasibility.

The analysis of the results of student's assessment should guide medical schools in optimising teaching and learning processes. For students, it should contribute to their self-learning, so that they can play an active role in the process of their own improvement.

REFERENCES

1. Norcini JJ, & McKinley DW. Assessment methods in medical education. Teaching and teacher education. 2007 april;23(3):239-50. http://dx.doi.org/10.1016/ j.tate.2006.12.021.

2. Norcini JJ. Current perspectives in assessment: the assessment of performance at work. Med Educ. 2005 Sep;39(9):880-9. doi: 10.1111/j.1365-2929.2005.02182.x. PMID: 16150027.
3. Harden RM, Stevenson M, Downie WW, Wilson GM. Assessment of clinical competence using objective structured examination. Br Med J. 1975 Feb; 1(5955): 447-51. Available from: https://doi.org/10.1136/bmj.1.5955.447.
4. Epstein RM. Assessment in medical education. N Engl J Med. 2007 Jan 25;356(4):387-96. doi: 10.1056/NEJMra054784. PMID: 17251535.
5. Miller GE. The assessment of clinical skills/competence/ performance. Acad Med. 1990 Sep;65(9 Suppl):S63-7. doi: 10.1097/00001888-199009000-00045. PMID: 2400509.
6. Harden RM, Crosby JR, Davis MH, Friedman M. AMEE Guide No. 14: Outcome-based education: Part 5-From competency to meta-competency: a model for the specification of learning outcomes. Med Teach. 1999;21(6):546-52. doi: 10.1080/01421599978951. PMID: 21281173
7. McAleer S. Choosing assessment instruments. In: Dent JA, Harden RM, editor (2nd edition). A Practical Guide for Medical Teachers. London, UK: Elsevier Churchill Livingston; 2005. p 302-10.
8. Schuwirth LWT, van der Vleuten CPM. Written assessments. In: Dent JA, Harden RM, editor (2nd edition). A Practical Guide for Medical Teachers. London, UK: Elsevier Churchill Livingston; 2005. p 311-22.
9. Constructing Written Test Questions for the Basic and Clinical Sciences. Copyright © 2016 National Board of Medical Examiners® (NBME®).
10. McCoubrie P, McKnight L. Single best answer MCQs: a new format for the FRCR part 2a exam. Clin Radiol. 2008 May;63(5):506-10. doi: 10.1016/j.crad.2007.08.021. Epub 2008 Jan 14. PMID: 18374712.
11. Walsh JL, Harris BH, Smith PE. Single best answer question-writing tips for clinicians. Postgrad Med J. 2017 Feb;93(1096):76-81. doi: 10.1136/postgradmedj-2015-133893. Epub 2016 Jul 1. PMID: 27371033.
12. McCoubrie P. Improving the fairness of multiple-choice questions: a literature review. Med Teach. 2004 Dec;26(8):709-12. doi: 10.1080/01421590400013495. PMID: 15763874.
13. Klass D. Reevaluation of clinical competency. Am J Phys Med Rehabil. 2000 Sep-Oct;79(5):481-6. doi: 10.1097/00002060-200009000-00018. PMID: 10994893.
14. Marks M, Humphrey-Murto S. Performance assessment. In: Dent JA, Harden RM, editor (2nd edition). A Practical Guide for Medical Teachers. London, UK: Elsevier Churchill Livingston; 2005. p 323-35.
15. Davis MH, Ponnamperuma GG. Work-based assessment. In: Dent JA, Harden RM, editor (2nd edition). A Practical Guide for Medical Teachers. London, UK: Elsevier Churchill Livingston; 2005. p 336-45.
16. Norman G. The long case versus objective structured clinical examinations. BMJ. 2002 Mar 30;324(7340):748-9. doi: 10.1136/ bmj.324.7340.748. PMID: 11923143; PMCID: PMC1122692.
17. Norcini JJ, Blank LL, Duffy FD, Fortna GS. The mini-CEX: a method for assessing clinical skills. Ann Intern Med. 2003 Mar 18;138(6):476-81. doi: 10.7326/0003-4819-138-6-200303180-00012. PMID: 12639081.
18. Harden RM, Gleeson FA. Assessment of clinical competence using an objective structured clinical examination (OSCE). Med Educ. 1979 Jan;13(1):41-54. PMID: 763183.
19. Hodges B, McIlroy JH. Analytic global OSCE ratings are sensitive to level of training. Med Educ. 2003 Nov;37(11):1012-6. doi: 10.1046/j.1365-2923.2003.01674.x. PMID: 14629415.
20. Patrício MF, Julião M, Fareleira F, Carneiro AV. Is the OSCE a feasible tool to assess competencies in undergraduate medical education? Med Teach. 2013 Jun;35(6):503-14. doi: 10.3109/0142159X.2013.774330.
21. Gormley G. Summative OSCEs in undergraduate medical education. Ulster Med J. 2011 Sep;80(3):127-32. PMID: 23526843; PMCID: PMC3605523.
22. Reznick RK, Blackmore D, Cohen R, Baumber J, Rothman A, Smee S, Chalmers A, Poldre P, Birtwhistle R, Walsh P, et al. An objective structured clinical examination for the licentiate of the Medical Council of Canada: from research to reality. Acad Med. 1993 Oct;68(10 Suppl):S4-6. doi: 10.1097/00001888-199310000-00028. PMID: 8216627.
23. Davis MH, Harden RM. Competency-based assessment: making it a reality. Med Teach. 2003 Nov;25(6):565-8. doi: 10.1080/0142159032000153842. PMID: 15369903.
24. Driessen EW, van Tartwijk J, Overeem K, Vermunt JD, van der Vleuten CP. Conditions for successful reflective use of portfolios in undergraduate medical education. Med Educ. 2005 Dec;39(12):1230-5. doi: 10.1111/j.1365-2929.2005.02337.x. PMID: 16313582.
25. Davis MH, Ponnamperuma GG. Portfolios, projects and dissertations. In: Dent JA, Harden RM, editor (2nd edition). A Practical Guide for Medical Teachers. London, UK: Elsevier Churchill Livingston; 2005. p 347-56.
26. Smith PC, & Kendall LM. Retranslation of expectations: An approach to the construction of unambiguous anchors for rating scales. Journal of applied psychology.1963. 47(2): 149-55. https://doi.org/10.1037/h0047060
27. Likert R. A technique for the measurement of attitudes. Archives of Psychology. 1932. vol 140:1-55.
28. Guilford JP. Psychometric methods. 2nd ed. New York: McGraw-Hill; 1974
29. Falchikov N, & Boud D. Student Self-Assessment in Higher Education: A Meta-Analysis. RER. 1989. 59(4): 395–430. https:/ /doi.org/10.2307/1170205
30. Van Der Vleuten CP. The assessment of professional competence: Developments, research and practical implications. Adv Health Sci Educ Theory Pract. 1996 Jan;1(1):41-67. doi: 10.1007/BF00596229. PMID: 24178994.

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