ESCOLA NACIONAL DE SAÚDE PÚBLICA

Utilização de ferramentas de Inteligência Artificial no apoio à tomada de decisão na gestão e administração hospitalar

Curso de Especialização em Administração Hospitalar

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Maio, 2024

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Trabalho de Campo apresentado para cumprimento dos requisitos necessários à obtenção do grau de Especialista em Administração Hospitalar realizado sob a orientação científica da Professora Teresa Magalhães, Dr.ª Tatiana Silvestre e Dr.ª Joana Seringa.

Maio, 2024

Agradecimentos

“As nossas escolhas resultam em percursos. Os percursos determinam ações e as nossas ações produzem efeitos.” Começou assim a minha carta de motivação para o Curso de Especialização em Administração Hospitalar.

Agradeço em primeiro lugar a todos os colegas e amigos do CEAH 53.º pela honra em poder representá-los enquanto delegado de turma. Levo cada um de vós para a vida. Ganhamos experiência quando partilhamos desafios e espero ter-vos sido útil nesta “viagem”. Disponham.

Agradeço à Professora Teresa Magalhães pela disponibilidade e orientação neste trabalho e durante o CEAH. Agradeço à Dr.ª Joana Seringa pelas críticas pertinentes e sugestões de melhoria. Agradeço à Dr.ª Tatiana Silvestre pelas reflexões, compromisso e apoio desde a minha primeira manifestação de interesse em abordar esta temática durante o estágio. Os vossos contributos foram determinantes e estão certamente espelhados neste documento.

Agradeço aos mentores com quem cruzei caminhos e aprendi a manter próximos. Pela presença contínua, pelos ensinamentos, com o vosso incentivo, e em particular por me desafiarem a manter-me “desconfortável”.

Agradeço aos colegas de trabalho e à ULS de Coimbra por me terem proporcionado o enquadramento que tornou um CEAH uma realidade e um desejo. Aos que me apoiam e acreditam que todos podemos crescer quando um se desafia, mas também aos outros que me encorajam com as incertezas e indiferença que transmitem.

Agradeço em especial à Renata, companheira de vida, pelo apoio incondicional, pelos momentos em que estive ausente ou menos disponível, pela tolerância com as minhas inquietações e pelas partilhas que me fazem refletir nas minhas ações e no meu percurso.

Da incerteza surge uma escolha e da ousadia um desafio para compreender que da incerteza também surgem escolhas determinantes, aprendizagens transformadoras e certamente novas incertezas, novas oportunidades e novos desafios.

A todos, o meu reconhecido e sincero obrigado.

Resumo

Introdução: A utilização de ferramentas de Inteligência Artificial (IA) no apoio à tomada de decisão em gestão hospitalar apresenta um potencial significativo para transformar a eficiência operacional e a qualidade dos serviços de saúde.

Metodologia: Este estudo descritivo e exploratório investiga a perceção de gestores hospitalares sobre a integração de IA na gestão hospitalar, destacando os desafios atuais e as oportunidades futuras. Foram realizadas entrevistas semi-estruturadas a 15 gestores hospitalares, e as suas respostas foram analisadas para identificar os temas principais e padrões emergentes.

Resultados: Os gestores destacaram ineficiências na tomada de decisão atual, como a comunicação comprometida e o acesso limitado aos dados. Ferramentas tradicionais e sistemas de business intelligence ainda são prevalentes, mas há uma necessidade de soluções mais avançadas e integradas. Os gestores expressaram opiniões variadas sobre a IA, reconhecendo o seu potencial para a eficiência e melhoria na tomada de decisão, e preocupação com a privacidade dos dados, questões éticas e a potencial perda de empatia humana. Os desafios incluem variabilidade nas competências técnicas, a fragmentação dos dados e a resistência à mudança. Uma infraestrutura robusta de dados e formação adequada são essenciais para a integração bem-sucedida da IA.

Conclusão: O estudo apresenta um panorama complexo onde os potenciais benefícios da IA na gestão hospitalar são equilibrados por desafios significativos. A integração bem-sucedida de IA exige uma estratégia participativa. Este estudo sublinha a necessidade de equilibrar a inovação com a humanização dos processos de mudança, promovendo uma integração ética e eficaz da IA na gestão hospitalar.

Palavras-chave: Inteligência Artificial; Tomada de decisão; Transformação digital; Gestão Hospitalar; Administração Hospitalar.

Abstract

Introduction: The use of Artificial Intelligence (AI) tools in decision-making support for hospital management presents significant potential to transform operational efficiency and the quality of healthcare services.

Methods: This descriptive and exploratory study investigates hospital managers' perceptions of integrating AI into hospital management, highlighting current challenges and future opportunities. Semi-structured interviews were conducted with 15 hospital managers, and their responses were analyzed to identify key themes and emerging patterns.

Results: Managers highlighted inefficiencies in current decision-making processes, such as compromised communication and limited data access. Traditional tools and business intelligence systems remain prevalent, but there is a need for more advanced and integrated solutions. Managers expressed varied opinions on AI, recognizing its potential for efficiency and decision-making improvement while also voicing concerns about data privacy, ethical issues, and the potential loss of human empathy. Challenges include variability in technical skills, data fragmentation, and resistance to change. A robust data infrastructure and adequate training are essential for the successful integration of AI.

Conclusion: The study presents a complex landscape where the potential benefits of AI in hospital management are balanced by significant challenges. Successful AI integration requires a participatory strategy. This study underscores the need to balance innovation with the humanization of change processes, promoting an ethical and effective integration of AI in hospital management.

Keywords: Artificial Intelligence; Decision Making; Digital Transformation; Hospital Management; Hospital Administration.

Índice

1. Introdução geral do estudo

O mercado da saúde é cada vez mais exigente e competitivo, pelo que se torna imperativo, a agilização de procedimentos e processos, com o objetivo principal de fornecer serviços de excelência que acrescentem valor efetivo para o utilizador e para a sociedade. O grau de complexidade e o número de respostas necessárias são cada vez maiores, impondo elevados padrões de gestão e de qualidade clínica, com um foco constante na gestão eficiente dos recursos, equidade no acesso, segurança, gestão de risco e sustentabilidade[1–3].

O atual modelo organizativo do SNS, assenta em Unidades Locais de Saúde (ULS), que resultaram da integração de um ou mais hospitais com os Centros de Saúde, Unidades de Saúde Familiar, Unidades de Cuidados na Comunidade e Unidades de Cuidados de Saúde Personalizados, entre outras, de uma área de influência territorial. A estrutura organizacional interna de cada ULS é similar, assentando em diversos serviços e departamentos clínicos, órgãos de apoio técnico e áreas de suporte, prestação, apoio à gestão, logística e apoio técnico especializado. Neste sentido, o contexto de realização do trabalho incidiu sobre as diversas áreas e serviços de gestão intermédia e de topo das ULS, que pela natureza das suas funções de gestão e administração hospitalar, necessitam de tomar decisões com base num processo comum que compreende: consulta, análise, avaliação, documentação, previsão e monitorização de dados introduzidos ou disponíveis em diferentes ferramentas e plataformas digitais da instituição ou nacionais.

As instituições de saúde têm criado um caminho de transformação, com a disponibilização e desenvolvimento de um conjunto diversificado de plataformas e ferramentas digitais de apoio à atuação dos gestores intermédios, incluindo os administradores hospitalares, enfermeiros gestores e diretores de serviço, bem como para o apoio a gestores de topo, vogais executivos de conselhos de administração, organismos regionais/nacionais e departamentais, com responsabilidades sistémicas e transversais ao SNS.

A utilização de meios digitais é já uma realidade transversal nas organizações, com avanços claros nos padrões de documentação profissionais, acesso a múltiplos dados e plataformas para tratamento de informação clínica, de saúde e administrativa. A existência de sistemas informatizados e ferramentas digitais cumpre os objetivos de melhorar os

cuidados de saúde prestados e reforçar a segurança dos doentes, e tem impacto na melhoria da qualidade clínica e organizacional. Contudo, as oportunidades de transformação digital nas organizações e inclusivamente, na atuação dos profissionais, não se esgotam na vertente clínica[4–6]. Nos dias de hoje, a gestão e administração hospitalar enfrentam inúmeros desafios como a complexidade das decisões, variabilidade de informação, volume de dados, imposição de *timings*, limitada interoperabilidade, baixa integração de dados, diferenciação de competências digitais entre profissionais, entre outros, pelo que os sistemas digitais existentes parecem não ser ainda elementos facilitadores.

Enfrentamos atualmente a implementação de novos paradigmas em ciência de dados dentro dos sistemas de informação. Este desenvolvimento amplifica a eficácia da utilização da informação através da integração de ferramentas avançadas e em constante evolução, que combinam diferentes modelos de inteligência artificial (IA). As ferramentas de IA são cada vez mais complexas e precisas, e a sua aplicação em plataformas clínicas digitais parece cada vez mais uma inevitabilidade entretanto comprovada em diferentes campos e áreas da sociedade[6,7]. Este tipo de tecnologia permite gerar uma capacidade analítica, preditiva e inclusivamente estratégica, pelo que o reconhecimento do seu potencial, ditará um caminho de mudança do padrão das plataformas digitais e uma janela de evolução significativa na consecução de intervenções de análise, avaliação e decisão nas organizações de saúde[4,8–10].

Apesar da integração de ferramentas de IA nos sistemas clínicos ainda ser incipiente[11], esta utilização deve ser devidamente e rigorosamente ponderada, com vista a evitar qualquer violação dos direitos dos doentes ou prejudicar, ainda que de forma não percetível, a qualidade assistencial dos cuidados de saúde prestados. Indissociavelmente, a IA pode contribuir para a recolha e interpretação de dados, potenciando elevados níveis de segurança e a melhoria dos resultados de decisões, resultantes da sua enorme capacidade analítica[12]. Para além disso, a diversidade de opções de tratamentos, processos terapêuticos e evolução constante na evidência, resultam numa complexa estrutura de variáveis e volume de dados que estão, cada vez mais, para lá da capacidade humana de gerir e processar[13,14].

Importa assinalar que a IA é um tema pouco conhecido dos profissionais de saúde e está aparentemente revestida de desconfiança, o que possibilita a sua desvalorização no ambiente clínico ou até comprometer a eficácia e precisão pelo alheamento destes no

acompanhamento e participação em processos de desenvolvimento deste tipo de ferramentas[13,15–17]. As soluções de IA devem assumir o potencial de complementaridade na otimização da decisão clínica e não ser alternativa a um profissional de saúde, pelo que a responsabilidade integral na tomada de decisão e seus efeitos, é sempre do profissional de saúde. Este ponto é um determinante para a satisfação e confiança dos utilizadores dos serviços neste tipo de instrumento de apoio dos profissionais de saúde[18–21].

Paralelamente, o desenvolvimento permanente da tecnologia abre necessariamente oportunidades de reflexão e potencia a evolução do que hoje existe ao dispor dos diferentes agentes responsáveis pela gestão em saúde. O fornecimento de serviços de excelência e a definição de processos consonantes com as necessidades da população, são garantia de acesso e de qualidade dos cuidados, e devem ser permanentemente considerados. Deste modo, a existência de mecanismos de gestão eficiente, processos ágeis e objetividade na atuação profissional dos gestores e administradores, assume um valor determinante para a equidade e justiça social no direito à saúde, otimização da utilização dos recursos e desempenho organizacional de qualidade[22,23].

A aplicação de IA pode representar uma oportunidade de melhoria significativa da eficiência operacional, e contribuir para a otimização de processos organizacionais de um hospital ou unidade local de saúde, como a gestão de recursos, gestão de doentes, gabinete do cidadão, serviços hoteleiros, gestão de transportes, gestão do acesso entre outros, com potenciais impactos na experiência dos utilizadores, satisfação profissional e boa utilização dos recursos humanos, materiais e financeiros das organizações.

Igualmente preponderante e já referido na vertente clínica, é a capacidade dos modelos de IA analisarem *big data*, tornando acessível com a sua implementação, a identificação de padrões ou tendências complexas, e até a possibilidade de gerarem *insights* que de outro modo escapariam ao “olhar humano” ou aos métodos tradicionais de *business intelligence*. Desta forma, a IA pode fornecer recomendações baseadas nas regulamentações, relatórios, índices, histórico, previsões, entre outras, otimizando a consulta da informação e garantindo claramente um apoio cabal, à tomada de decisão do gestor e administrador hospitalar.

A adaptação da resposta hoteleira e do atendimento do cidadão em todos os momentos de contacto, gerando personalização perante as necessidades e desejos identificados, de forma tempestiva, e sem compromissos de segurança, também poderão ser uma realidade. Associado a isso, a capacidade de gerir riscos e prevenir erros administrativos, garantindo

a otimização no acesso à resposta de saúde ou a comunicação coordenada entre todos os sistemas administrativos e logísticos de um ambiente organizacional de cuidados de saúde.

Este estudo pode também revelar áreas onde a IA possa ser aplicável, e ainda servir de guia para o desenvolvimento de programas de formação focados no fortalecimento de competências digitais, incluindo utilização de IA, para gestores e administradores hospitalares.

A implementação de ferramentas de IA nas organizações de saúde, pode contribuir para a otimização dos processos de gestão e administração hospitalar, gerar impacto positivo nos cuidados de saúde prestados, e consequentemente, contribuir para o acesso, bem-estar e a melhoria da qualidade dos serviços de saúde – ODS3 Saúde de Qualidade[24,25]. Em simultâneo, esta integração pode igualmente influenciar diversos aspetos de inovação tecnológica e de eficiência operacional, bem como promover parcerias relevantes entre os diferentes sectores: saúde, academia e empresas/indústria, fundamentais para o desenvolvimento sustentável[26].

Torna-se por isso imperativo, aprofundar o estudo sobre a utilização de ferramentas de IA no apoio à tomada de decisões neste tipo de ambiente complexo e no contexto da gestão e administração pública.

A aplicação de IA na gestão hospitalar poderá não ser apenas uma necessidade imediata, mas igualmente um passo determinante como garantia de um futuro mais eficiente, seguro e sustentável dos serviços e organizações de saúde. Deste modo, o objetivo geral deste estudo é explorar a utilização das ferramentas de inteligência artificial no apoio à tomada de decisão na gestão e administração hospitalar. De forma a tornar viável a consecução deste objetivo, definiram-se os seguintes objetivos específicos:

a) Analisar o estado atual da tomada de decisão na gestão e administração hospitalar;
b) Descrever o potencial da integração de ferramentas de IA na gestão e administração hospitalar;
c) Explorar a perceção dos gestores e administradores hospitalares sobre IA e sua utilização/integração como ferramenta de apoio nos processos de tomada de decisão;
d) Identificar os desafios e determinantes da integração de ferramentas de IA no processo de tomada de decisão na gestão e administração hospitalar.

Pretendeu-se que os métodos e análises fossem robustos, tendo sido considerada uma abordagem sistemática e coerente em todas as fases do estudo, com vista à produção de resultados válidos e confiáveis.

Deste modo, partiu-se de um enquadramento claro sobre os processos da gestão hospitalar e a compreensão dos desafios e complexidades associados às práticas atuais de tomada de decisão. Em seguida, teve lugar a recolha de dados através da realização de entrevistas, com a exploração da perceção dos gestores e administradores hospitalares sobre a utilização das ferramentas de apoio existentes e os desafios no processo de tomada de decisão, bem como sobre a integração e utilização de ferramentas de IA, e os desafios e determinantes da integração deste tipo ferramentas no apoio à tomada de decisão (Anexo I). As entrevistas foram conduzidas com respeito à integridade ética e confidencialidade, asseguradas pelo consentimento informado (Anexo II) e pela aprovação da Comissão de Ética da NOVA-ENSP (Anexo III). Após a codificação das entrevistas, os dados recolhidos, foram anonimizados e tratados de forma segura. A sua análise resultou numa codificação que permitiu identificar os temas e descrever os padrões recorrentes até à saturação da amostra (*n*=15), proporcionando uma compreensão aprofundada das perceções e experiências dos gestores hospitalares relativamente às ferramentas de IA e de apoio à tomada de decisão.

Os resultados foram apresentados de uma forma clara e estruturada, ligando-os na discussão, de volta aos objetivos iniciais do estudo e ao contexto mais amplo da literatura existente sobre o tema, e desse modo, garantir uma compreensão rica e contextualizada do objeto de estudo[27].

Considerando-se a intenção do investigador em publicar o resultado deste trabalho, optou-se pela sua apresentação e desenvolvimento no modelo por artigo, o qual contempla para além de introdução geral do estudo, o *draft* de artigo científico submetido na revista BMC Health Services Research, no dia 28 de maio de 2024.

2. Artigo científico submetido

Research article

Use of Artificial Intelligence tools in supporting decision-making in hospital management.

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Abstract

Background: The integration of Artificial Intelligence (AI) tools in hospital management holds potential for enhancing decision-making processes. This study investigates the current state of decision-making in hospital management, explores the potential benefits of AI integration, and examines hospital managers' perceptions of AI as a decision-support tool.

Methods: A descriptive and exploratory study was conducted using a qualitative approach. Data were collected through semi-structured interviews with 15 hospital managers from various departments and institutions. The interviews were transcribed, anonymized, and analyzed using thematic coding to identify key themes and patterns in the responses.

Results: Hospital managers highlighted the current inefficiencies in decision-making processes, often characterized by poor communication, isolated decision-making, and limited data access. The use of traditional tools like spreadsheet applications and business intelligence systems remains prevalent, but there is a clear need for more advanced,

integrated solutions. Managers expressed both optimism and skepticism about AI, acknowledging its potential to improve efficiency and decision-making while raising concerns about data privacy, ethical issues, and the loss of human empathy. The study identified key challenges, including the variability in technical skills, data fragmentation, and resistance to change. Managers emphasized the importance of robust data infrastructure and adequate training to ensure successful AI integration.

Conclusions: The study reveals a complex landscape where the potential benefits of AI in hospital management are balanced with significant challenges and concerns. Effective integration of AI requires addressing technical, ethical, and cultural issues, with a focus on maintaining human elements in decision-making. AI is seen as a powerful tool to support, not replace, human judgment in hospital management, promising improvements in efficiency, data accessibility, and analytical capacity. Preparing healthcare institutions with the necessary infrastructure and providing specialized training for managers are crucial for maximizing the benefits of AI while mitigating associated risks.

Keywords: Artificial Intelligence; Decision Making; Digital Transformation; Hospital Management.

Background

The implementation of computer systems and digital tools has proven crucial in improving healthcare and the safety of patients and users of healthcare services. The cross-sectional use of clinical technology highlights significant advances in professional documentation standards, data access, and platforms for handling clinical, health, and administrative information, indicating a movement toward digitalization as a fundamental strategy to face the current challenges of the sector[4–6,28].

In the current context of increasing demand and competitiveness in the healthcare market, streamlining procedures and processes emerges as imperative to providing healthcare services that add tangible value to both users and society. This need is accompanied by an increase in the complexity and volume of necessary responses, imposing high standards of management and clinical quality, focusing on efficient resource management, equity of access, safety, risk management, and sustainability[1–3].

The provision of excellent services and the definition of processes consistent with the population's needs guarantee access and quality of care and must be continuously

considered. Thus, the existence of efficient management mechanisms, agile processes, and objectivity in the professional performance of managers is crucial for equity and social justice in the right to health, optimization of resource use, and quality organizational performance[22,23].

The opportunity for digital transformation in healthcare organizations and professionals' performance is not limited to the clinical aspect, requiring a broader vision that includes hospital management[29]. Health institutions have been experiencing this path of change, with the development of a diverse set of digital platforms and tools supporting the performance of middle managers, including hospital administrators and health professionals with management roles, as well as supporting decision-making for top managers in local, regional, or national organizations.

However, hospital management currently faces numerous challenges in health systems, such as decision complexity, information variability, data volume/big data, timing impositions, intervention intensity, limited interoperability, low data integration, and differing digital competencies among professionals. Consequently, existing digital systems do not yet seem to be facilitating elements[1,30].

The continuous development of technology necessarily opens new opportunities for reflection and enhances the evolution of what is currently available to the various agents responsible for health management. The evolution of information systems, especially with the development of increasingly complex and advanced models of artificial intelligence (AI) and machine learning (ML), and their application in clinical tools, seems increasingly inevitable, as evidenced in different fields and areas of society[6,31].

Integrating AI into clinical systems faces risks such as a lack of transparency or excessive dependence. On the other hand, challenges include slow adoption, mistrust, undervaluation, and the need for rigorous consideration to avoid violations of patients' rights or compromising the quality of care provided[13,15–17,32].

The diversity of treatments and therapeutic processes, along with the constant evolution of evidence, results in a complexity of variables and data volume that exceed human capacity for management and processing, highlighting the need for systems that can effectively assist in decision-making processes[13,14,31].

There are AI applications that promote resource optimization and service efficiency through the analysis of patients' data history, bed occupancy, and human resources[33,34]. Population

risk stratification, personalized patient education, and simplification in scheduling consultations and exams are other examples of its importance in providing healthcare[35–37]. This type of technology allows for analytical, predictive, and even strategic capabilities. Thus, recognizing its potential will dictate a path of change in the pattern of digital platforms and a significant window of evolution in conducting analysis, evaluation, and decision-making interventions in healthcare organizations[4,8–10,38].

Therefore, it becomes imperative to explore the use of AI tools in supporting decision-making in this complex environment and in the context of hospital management, aiming to analyze the current state of decision-making, describe the potential of integrating AI tools in hospital management, and explore hospital managers' perception of AI and its application as a support tool in decision-making processes. Additionally, it aims to identify the main challenges and determinants for the effective integration of AI tools in decision-making processes in hospital management.

Methods

Considering the objectives intended with this study, a descriptive and exploratory investigation was applied, using a qualitative approach aimed at understanding and characterizing the phenomenon under study[27]. The purpose of data collection was to capture a broad range of experiences and opinions about the challenges, opportunities, and implications of integrating AI tools and decision support into management in healthcare organizational contexts, thus contributing to a richer and more multifaceted understanding of the topic.

Data collection was carried out through semi-structured interviews, aimed at capturing the perceptions of hospital managers about existing decision-support tools, as well as the functionalities and capabilities of AI tools in supporting decision-making in hospital management. In this sense, the study population consists of middle and senior managers, hospital administrators, as well as clinicians with management roles, who play a crucial role in decision-making processes, needing to consult, analyze, evaluate, document, predict, and monitor data from various tools and digital platforms at both institutional and national levels.

The recruitment of these participants ensured a balanced and diverse representation of different departments, hierarchical levels, and areas of specialization and expertise from

Table 1 Overview of interviewees

Interviewer	Qualifications	Professional Category	Position(s)	Experience
E1	Degree in Economics PgD in Hospital Administration	Hospital Administrator	Hospital Department Management (Board Member) Integrated Responsibility Center (Board Member)	14 years
E2	MSc in Health Management and Economics	Executive Manager (healthcare)	Hospital Department Management (Board Member)	30 years
E3	MSc in Management PgD in Hospital Administration	Hospital Administrator	Hospital Department Management (Board Member) Integrated Responsibility Center (Board Member)	8 years
E4	MBA in Administration PgD in Hospital Administration	Hospital Administrator	Board of Director's	21 years
E5	PgD in Hospital Administration	Hospital Administrator	Department Management (Head)	22 years
E6	PgD in Management PgD in Hospital Administration	Hospital Administrator	Department Management (Board Member)	3 years
E7	MSc in Management PgD in Hospital Administration	Hospital Administrator	Hospital Department Management (Board Member) Department Management (Head)	14 years
E8	MSc in Management PgD in Hospital Administration	Hospital Administrator	Department Management (Head)	6 years
E9	Degree in Economics PgD in Hospital Administration	Hospital Administrator	Department Management (Head) Hospital Department Management (Board Member)	15 years
E10	MSc in Health Management and Economics PgD in Hospital Administration	Executive Manager (healthcare)	Healthcare Manager Hospital Department Management (Board Member)	14 years
E11	Degree in Economics PgD in Hospital Administration	Hospital Administrator	Board of Director's	11 years
E12	MSc in Management PgD in Hospital Administration	Hospital Administrator	Hospital Department Management (Board Member) Integrated Responsibility Center (Board Member)	15 years
E13	MSc in Health Management and Economics PgD in Hospital Administration	Hospital Administrator	Hospital Department Management (Board Member)	18 years
E14	MSc in Management	Manager (healthcare)	Integrated Responsibility Center (Board Member)	9 years
E15	MSc in Management PgD in Hospital Administration	Hospital Administrator	Hospital Department Management (Board Member)	8 years

various institutions (**The interviews** were audio-recorded and transcribed verbatim. The data were anonymized at the time of recording and treated with utmost rigor and respect for the privacy of those involved, in line with the ethical principles of scientific research, and at no point was the identity of the interviewees shared. Thus, after conducting the interviews, textual transcription was carried out with accuracy and respect for the transmission of information from the interviewees, properly identified with an alphanumeric designation - for example, "E1." Access to the recordings and all resulting data remained restricted to those involved in the research and was secured through a coded digital folder.

). This multidisciplinary approach allowed for a more comprehensive and diverse view of the use and impact of AI in hospital management.

The script included open and closed questions, formulated in clear and accessible language, and a pre-test of the interview was conducted to optimize the script and prepare the interviewer/researcher. Thus, before the start of the interview, some time was dedicated to the presentation of the researcher and the objectives of the research, allowing the participant to familiarize themselves with the topic under study.

The ethical integrity of the study was duly ensured with the prior obtaining of informed consent from all participants, thereby guaranteeing their informed knowledge about the purpose of the research, treatment of the collected data, and also their right to withdraw and exit the study freely and at any point during the investigation. The study was approved by the Ethics Committee of NOVA-NSPH.

The interviews were audio-recorded and transcribed verbatim. The data were anonymized at the time of recording and treated with utmost rigor and respect for the privacy of those involved, in line with the ethical principles of scientific research, and at no point was the identity of the interviewees shared. Thus, after conducting the interviews, textual transcription was carried out with accuracy and respect for the transmission of information from the interviewees, properly identified with an alphanumeric designation - for example, “E1.” Access to the recordings and all resulting data remained restricted to those involved in the research and was secured through a coded digital folder.

Subsequently, the transcriptions were coded, a stage that involved identifying and categorizing themes, patterns, and emerging ideas from the participants' responses. The analysis of the interviews followed a scheme of predefined topics, ensuring a systematic and focused methodological approach. The data structuring thus had as its basis a set of predefined variables, from which a broad coding was carried out, allowing the identification of more general themes, as well as achieving a finer, more focused, and specific association, enabling an even more detailed analysis of the ideas and perspectives of the interviewees.

The number of interviewees (n=15) took into account the verification of sample saturation, that is, until the same ideas and concepts recurred in the participants' responses.

Results

The analysis of the interviews determined the need for an organized structure for presenting the results in points and subpoints, as shown in Error! Reference source not found.. This

organization aims to highlight the depth of the hospital managers' responses and support the reader's reflection process.

Current state of decision-making in health management

The interviews with hospital managers reveal a multifaceted reality and a complex landscape of the decision-making process. The content analysis shows that the efficiency of the decision process is influenced by a wide range of factors, from the existence and choice of technological/digital tools, the integration of new management practices and methodologies, the skills for data handling and analysis, and the sensitivity to human aspects.

Isolation in the process and poor communication

The isolated nature of decision-making, often exacerbated by insufficient or difficult access to necessary data: "*There is no practice of exchanging opinions or experiences, and sometimes, the information that (the manager) needs is exactly what is missing*" (E2). "*It is an extremely heterogeneous process*" (E6) "*lonely and often lacking information for a well-founded and safe decision-making*" (E2): reflects a significant issue of internal communication and collaboration among managers and other departments. "*The manager should, effectively, exist to make decisions and should not waste any time handling data"* (E6) and "*when we get to the information, the opportunity has already passed, so the time for intervention has already gone by*" (E12), which suggests the need for a more integrated strategy that promotes the exchange of information and experiences.

Humanization of decision-making

The importance of considering human and subjective elements in decisions is a vital theme. One participant emphatizes, "*it's trying to also listen to the people who may be involved...*" (E9), while another notes, "*the decision process usually starts with an attempt to collect data... but in principle always ends with some subjectivity of analysis and the personal perception of the manager...*" (E15). Despite the emphasis on objective data, individual perceptions and personal experiences still play a crucial role: "*the constrains, more than technological (…), are essentially human*" (E11). "*The main issue is people and how we try to make people adapt to technology, and often we cannot think in a way that allows technology to adapt to people.*" (E11): this statement highlights the complexity of health

management, where decision quality relies not only on quantitative analyses but also on the ability to interpret and integrate human and contextual insights.

Inefficiency in data utilization

The use of tools such as Excel® and Business Intelligence systems is a constant in the described management practices. "*We conduct feasibility studies, analyze production data...*" (E1) and "*Other existing tools include some developed dashboards*" (E3) illustrate a blend of traditional and modern methods. This mix suggests a gradual transition to more advanced technologies for presentation and access to information, still limited by the high prevalence of conventional practices – "*I use Excel® a lot*" (E1), a tool that participants unanimously reveal they use. Many managers express frustration with the use and analysis of data, highlighting an urgent need for automation and better integration. The common sentiment is, "*There's an extraction from databases and then work on them*" (E13) in Excel® and "*I already have my maps parameterized... But the truth is if this information was already available... I wouldn't have to spend so much time...*" (E1). "*The efficiency is zero... it's all very manual*" (E7). These quotes underscore the necessity for systems that automate repetitive tasks and integrate data in a useful and cohesive manner.

Fragmentation and limited data access

The heterogeneity of data platforms and inefficiencies in decision processes are points of concern. Examples like: "*we have more than 70 web-based applications*" (E4), "*in a large institution perhaps it's not easy to change everything overnight.*" (E6) and "*It should be a process based on indicators, on official data from the service and direct observation*" (E10) demonstrate variations in practices and highlight the need to adopt more effective technologies and more agile and automated management processes. These improvements can positively transform how decisions are made and implemented.

Fragmented information systems (lacking data interoperability) and limited access are often cited as major hurdles. Statements such as "*Often I have to go to two or three systems to be able to gather data*" (E6) and "*The limitation we have is data availability*" (E9), clearly demonstrate the need to consolidate platforms and improve IT infrastructure. Across the board, it is assumed that the efficiency of the decision-making process is "*reduced*" (E1, E3, E6, E7, E10, E12, E14) to "*moderate*" (E2, E4, E8, E9, E15).

The lack of data organization is widely criticized: "*Scattered and nonexistent information with a lack of specification*" (E2) and the need to "*improve the fine specification of information, allocate everything to one application*" (E2) are pointed out as major limitations. These points highlight the urgency to reformulate data management and structures to facilitate access and analysis.

Variability in technical skills and differentiation of competencies

The disparity in technical skills among managers is a recurring issue. As one participant notes, "*Excel® is already a complex tool and not everyone can work with it. In fact, there are people... who don't even know where to go to get the right information*" (E1), complemented by another remark: "*not everyone in hospital administration knows, masters, Excel®*" (E11). These difficulties highlight the crucial importance of personalized training programs that balance and develop the skills of human resources.

Additionally, the shortage of data specialists is another serious issue mentioned by multiple managers. "*We don't have... the capacity to hire people who are experts in data handling*" (E4), and "*We don't have people... we lack people with knowledge about data*" (E5) illustrate this significant gap in human capital, which hinders robust and multivariable data usage, exacerbating the difficulties of the process. In this context, several participants suggest the importance of recruitment strategies for other "new professions" (E15) in the field of data science, while simultaneously advocating for investment in the developing of professionals skills.

Balance between strategy and operation

Managers face the challenge of navigating between daily operational needs and strategic goals. For example, one manager notes: "*The decision-making process always has a more strategic framework... How does the measure we take impact the care we provide to patients?*" (E4). Another highlights the operational aspect, "*At the moment I can tell you that everything goes through the departments... But we end up having some decision-making power here more operationally*" (E7). This fluctuation requires a balance to avoid discontinuities in quality and effectiveness of operations, and to ensure consistency in administration policies and practices: "*this has a lot to do with the leadership and the methodology they bring (the board). Building decision is not easy because hiearchies are not always respected*" (E7).

Organizational change management and governance

Managing organizational change is a particularly challenging area, with managers highlighting cultural resistance: "*It seems to me that the main challenge and also the great benefit are the people*" (E3), and "*the little efficiency... mainly due to the people... to the existing institutional culture*" (E6). Moreover, the participants emphasize the need for strong leadership and inclusive, participatory organizational change programs that promote robust digital transformation strategies, technological adaptation, and innovation: "*The administrations do not listen to the managers*" (E2), "*not only do they not inquire about the adequacy of the available information, but they also do not listen when managers complain about its quality*" (E2).

The lack of clarity in operational rules complicates decision-making, as observed in various statements: "*Sometimes it's difficult because they (the rules) often aren't clear*" (E8) and the "*uncertainty in the outcomes of human decisions*" (E8) is mentioned. Standardization of policies and the implementation of clear guidelines are perceived as essential for improving the efficiency of the process and the security of the decisions: "*We need a digital transformation with someone who knows what AI can do (...), and how we can transpose that to human resources, to scheduling, and to everything that is the support structure of the organization, how all of that can be automated.*" (E15) and "*The efficiency is currently quite fragmented by the need to search for data*" (E10).

Autonomy in data management and greater interoperability between systems and platforms are seen as crucial to overcoming these limitations: "*Some of these additional tools (...) were developed many years ago and provided some competitive advantage, but in any case, generally, they are still not for supporting decision-making.*" (E3). "*The information system should, in some way, be customizable to the main needs of the organization*" (E14), Managers criticize the dependency on external systems and the conditional access to data, "*We are always dependent... on SPMS (the national structure that manages and develops the information systems of the Portuguese Ministry of Health) to do it*" (E9) or "*reliance on third parties (contracted companies) to obtain information that should be available*" (E13).

Perception of hospital managers on AI and its application as a support tool in decision-making processes

Participants highlighted expectations and challenges associated with the implementation, integration, and use of AI tools in decision-making in hospital management. The content analysis seems to demonstrate the potential and capacity to optimize the process and improve the efficiency of decision-making in health organizations and institutions.

Cultural expectations and human empathy

The implementation of AI solutions should be preceded by a careful analysis of real needs, as emphasized by several managers. One of them expresses the need for caution: "*I realized that it wasn't worth starting a pilot, when it is still necessary to really understand what the needs are*" (E14). This approach is crucial to ensure that innovations are relevant and effective, reflecting the operational reality of hospitals.

The long-term vision for AI is broadly positive, with managers anticipating its inevitable integration into hospital management practices: "*Understanding what is really going on, sometimes, forces us also to create tools that, perhaps in the past, we didn't even dare to think would be possible, but nowadays we can*" (E5) and "*I think in the next few years... we will have AI technologies as a decision-support system*" (E5). However, the need to culturally adapt institutions to these changes is also recognized: "*I think it is desirable and I think it is inevitable. Obviously, AI imposes some precautions since in the end the problem with AI will always be the human component.*" (E6), emphasizing that successful implementation of AI will depend on a change of mindset among managers and healthcare professionals. However, it is also clear that managers want to be part of this change: "*it seems to me that (AI) has immense potential and we cannot stop. If we stop, someone will advance sooner or later. The difference is whether we want to be dragged or be the ones dragging.*" (E15).

While operational efficiency is a clear advantage, there is substantial concern about the potential loss of "*empathy*" and human sensitivity in decisions. Managers highlight that "*to make a decision as managers, we must listen to the employees... because sometimes, what AI might be giving us, that information, can have other nuances*" (E11). This quote illustrates managers' sensitivity to the complexity of decisions in health management, which often require a deep understanding of human circumstances.

Agility and efficiency in the decision-making process

The perception of the capacity and potential of AI to streamline processes is clear and recurrent: "*It would be a valuable asset with direct application in daily decision-making.*"

(E10). As described by several managers, "*We don't have the capacity to do it in a timely manner, and to do so, we have to extract several databases, cross them, to get there and, when we get to the information, the opportunity has already passed, so the time for intervention has passed and in this way, we can have it in the moment*" (E12), "*It would be much more agile for me not to lose time working on data, but to look at them and then, based on that, make real decisions*" (E1). It was also repeatedly mentioned how AI could instantly respond to operational questions, facilitating more effective and efficient management: "*Imagine: I could say 'Dr. X needs a consultation room on Monday morning. Is there a vacancy?' for example, if I could ask this question and AI answered me 'yes, from 9 am to 12:30 pm, offices Y and Z are free. Would you like to reserve one for Dr. X?' It would be fantastic*" (E1); "*Imagining a scenario in which I would have support and access to information in real-time in an integrated way... It would be fabulous.*" (E10) and "*for example, from the perspective of a central warehouse, where we can somehow anticipate that that service, on a day-to-day basis, will have a peak and articulate this with the information that it is having more complex users or is caring for more users and, therefore, this will translate into an increase in consumption.*" (E13).

AI is seen as a promising tool for optimizing human resource management. "*Establishing relationships between existing provisions, proposed by the system... revealing individual productivity by doctor*" (E2), shows how AI can facilitate more precise and well-founded management. The aggregation of these functions by AI could free managers to focus more on planning or strategy tasks, as also suggested by another participant in the study: "*such a tool would help us to really perform our role in a much more correct way*" (E14).

Several managers noted how AI could be applied: "*there are thousands of processes that need to be improved in terms of efficiency, and it is possible to take advantage of this technological side to help improve this process*" (E15). Thus: "*The areas that seem most susceptible to being used by AI algorithms in management are areas of predictive analysis*" (E5), and another adds, "*I see a lot of AI capacity used in terms of logistics principles*" (E12), "*for example, from a perspective of a central warehouse, where we can somehow anticipate that that service, on a day-to-day basis, will have a peak and articulate this with the information that it is having more complex users or is caring for more users and, therefore, this will translate into an increase in consumption*" (E13). These perspectives highlight the potential of AI to optimize resources and improve production.

Acess and information management

AI is perceived as a tool that can significantly simplify access to complex information, as indicated in various reviews: "*It would be a much more user-friendly scenario...*" (E2) and "*I would really like to come here to the computer and write: tell me the relationship between the prescription of medications and the comorbilities of the patients...*" (E4). These managers value the possibility of obtaining quick and accurate answers, reducing the time currently spent on complex and time-consuming analyses: "*It would ultimately facilitate my work.*" (E12) and "Move from reactive management to planned and proactive management." (E10).

A crucial point is the need for a robust data infrastructure to support AI: "*what we are saying is not science fiction... We have the data for this, and I ask these questions...*" (E4) and "*a logic where there is a single data center... That would be spectacular.*" (E7) shows the importance of a solid and well-organized database. The integration of different data sources and the robustness of the information system infrastructure are seen as essential to maximizing the potential of AI: "*AI is one of the most disruptive tools and one that will most allow us to evolve from a management perspective, both clinical and corporate, that we have ever had.*" (E13).

Integration and regulation challenges

Despite the evident enthusiasm, there is also an awareness of the challenges that AI can represent. The integration of AI is not without challenges, especially in terms of expectations versus reality: "*ChatGPT has brought the wrong thinking that a system can do everything*" (E5). Some managers even express some skepticism about the viability and effectiveness of AI: "*I use ChatGPT 4... but it has a big deficit from the point of view of what is comprehension*" (E3) and "*I confess I am a bit skeptical... I think the viability may not be what we need*" (E7). These perspectives suggest that beyond technical implementation, it is vital to consider the sustainability and real impact of AI on daily operations and the need to adjust expectations and adequately prepare the organizational culture for the changes brought by AI: "*I have no major concerns except this one, that people ask and think it is a technocratic application of AI and that can sometimes lead not to the best solutions, or that the solutions that were actually good are not implemented because they were not discussed afterwards.*" (E12). A participant states, "*Being able to anticipate what I think... I have some doubts!*" (E3), expressing caution about AI's ability to replicate complex human thought. "The gain seems to be greater than the risk." (E14) but ethical concerns are significant for most

participants: "*Ethical concerns... whether in terms of data protection and privacy*" (E7), particularly the need for careful regulation of technology: "*I think it would be a valuable asset to have AI... As long as it is properly regulated*" (E2) but it's also clear that "*We should not stop innovation because of risk issues. We must analyze and understand the risks. Understand if they are acceptable within our regulatory model and essentially move forward.*" (E14).

Transformation of the managerial role

Participants anticipate a significant change in their daily roles, with AI potentially reducing the time spent on more administrative tasks, allowing greater focus on strategic activities. As mentioned by several managers, "*These days the role of the manager involves a lot of operational work*" (E13), emphasizing the time spent searching for the data and information that support the decision. "*We end up not having the time to do really what we studied for and what the institution supposedly needs from us, which is to plan, to monitor, and to improve. And we, most of the time, are not doing that*" (E1). AI is perceived as a tool that can "*help us really perform our role in a much more correct way*" (E14), optimizing planning, performance monitoring, and continuous improvement of outcomes and quality.

Some managers point to AI as a facilitator that can "*free up time to convince people, to involve people in the projects*" (E4). This perspective suggests that AI, by automating repetitive tasks, could provide more opportunities for meaningful human interactions, essential for effective change management.

Overall, the use of AI is also perceived as a support tool for the manager, but not as a replacement in the decision-making process. As one participant expressed, "*AI should always be an instrument in aiding decision-making and never the decision-making itself*" (E6) and "*In reality, decision-makers are the hardest to replace because the one thing that the machine mostly does not do is make the decision.*" (E3). This approach highlights the need to maintain human oversight over critical decisions, ensuring that technology serves as a support and not as a substitute: "*I know the business, but I know nothing about the technology and I know it exists. Someone who knows a lot about technology knows nothing about the business. And bringing these two parts together, I think we are very far from it!*" (E15).

The need for differentiated and specialized training in AI is emphasized to ensure that managers can use these technologies effectively while maintaining ethical principles: "*The main constraints result from the lack of knowledge... and with technology these issues are overcome.*" (E11). The "training for basic and advanced use of AI and digital tools" (E10) should be "*theoretical-practical*" (E2), focused not just on how to use AI, but also on understanding "*regulation and ethics in its use*" (E2). "*It is normal that people who graduated in management some time ago are not formatted to take advantage of the tools.*" (E5), and this aspect could be crucial for integrating AI responsibly into hospital management.

Maintaining the human element

Despite technological advances, it is recognized that the human and relational component in healthcare is irreplaceable: "*Healthcare today has a human and relational component that... is irreplaceable for AI*" (E6). This recognition emphasizes a balanced and cautious perspective on the implementation of AI, underlining that technology should enhance, not diminish, the human quality of hospital management: "*Our role as administrators, as managers on the boards of directors, or in another role, will continue to be very much this: that we manage, then, not to spend so much time on structuring, and that frees us up time to convince people, to involve people in what the projects we have to implement are, or the changes, or the small points*" (E4).

"*AI is one of the most disruptive tools and one that will most allow us to evolve from a management perspective, both clinical and corporate, that we have ever had*" (E13). Some managers envision a future where healthcare transcends the physical limitations of institutions, a concept described as "*the hospital without walls*" (E3). AI can support this model by facilitating quick and informed decisions, while reiterating the uniqueness and irreplaceability of human judgment: "*The worst thing we do is come up with optimal solutions for the wrong problems. And I think this is the issue: regardless of whether AI exists or not, we will still need managers, at least for the next few years. It's us (the managers) who ask the questions*." (E14).

Interviews with hospital managers about the implementation of AI in the hospital context reveal a complex panorama, illustrated in **Error! Reference source not found.**, where enthusiasm for technological innovation is balanced with pragmatic and ethical concerns. In terms of operational efficiency and human resource management, managers see AI as a transformative tool, capable of reducing the time spent on administrative or low-value tasks,

and a way to focus on more strategic functions, such as planning and improving services: "*It will help us free up time so that we can interact more with people, because without doing that we will not be able to get the projects on the ground, get things moving.*" (E13). However, there is a cross-sectional perspective, illustrated by one of the participants: "*we end up not having the time to do really what we studied for and what the institution supposedly needs from us, which is to plan, to monitor, and to improve. And we, most of the time, are not doing that*" (E1).

On the other hand, the adequacy of the data necessary to support decision-making is a recurring concern. Participants highlight the need for robust and secure databases to maximize the effectiveness of AI integration, underscoring that any technological

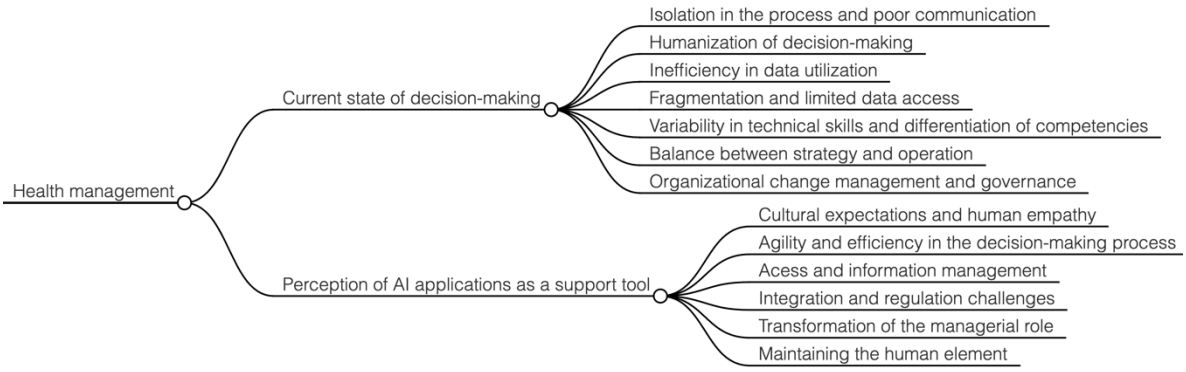

Figure 1 – Mind map of coded interview results with hospital managers

implementation should be preceded by a rigorous analysis of the institution's real needs. Ethical issues are also predominant, with various statements about the protection and privacy of data and the integrity of the decision occupying a central place in the different interviews. In addition, there is a clear concern about the potential loss of empathy and human contact in decisions, an aspect pointed out as fundamental in the management of organizations in general and in health institutions in particular.

Resistance to change emerged as a significant theme, with many managers expressing skepticism about the long-term viability of AI and concerns about its comprehension and interpretation capabilities in complex contexts. Adequate training in AI, covering both the use of tools and potential technological applicability as well as ethical aspects, was identified as essential for a successful integration of these tools.

The potential of AI to transform hospital management, automation, and efficiency is recognized, being pointed out as vital to ensure humanization in the decision-making process, guarantee data security, and promote a culture of acceptance of innovation. Managers unanimously consider that AI should be used as a support tool for decision-making, complementing, and not replacing, human judgment, as substantiated by the quote: "*AI should always be an instrument to assist in decision-making and never the decision-making itself*" (E6). This balance between innovation and caution/consideration is considered essential for the impact of future integration and use of AI in health organization management.

Discussion

The study explored the use of AI tools in hospital management, a field of increasing importance, with potential for change in operational efficiency and optimization of decision-making processes in health organizations and services. Across the board, the results reflect a multifaceted perspective of hospital managers on the current situation versus an innovative scenario with AI integration[39–41].

In the context of implementing AI tools in hospital management, this study made evident the high expectations of managers regarding the relative advantage of AI, somewhat aligned with perceptions revealed in the literature[39,42–44]. Thus, although significant optimism about the potential benefits of AI is evidenced, substantial skepticism about its evidence base persists[45,46]. The hesitation of managers to fully adopt AI, due to its early stage of implementation, reflects an important barrier that has also been observed in other research[42,43]. This point underscores the critical need to strengthen the evidence base supporting the efficacy of AI in health management contexts[40,47,48].

Moreover, the notion that the complexity of implementing AI as a complement to health management is perceived as both an opportunity and a challenge is well evidenced[49]. As demonstrated, managers expressed conflicting perceptions about the complexity of AI, describing it as both inevitable and indispensable, but reiterating their low understanding and specific training on the subject. The lack of understanding about AI models emerges as a complicating element for trust in its use and full comprehension of its functionalities and practical advantages[40,50]. This situation, while not exclusive to health institutions and managers, becomes critical due to the impact it could have on the decision to adopt it as a tool to support organizational and even clinical management, due to the indirect effects of

management mechanisms on health structures[51–53]. The ethical concerns expressed by managers are evident and expected [32]. This point is fundamental not only to maintain the trust of patients and health professionals but also to ensure legal compliance, safety, and the long-term sustainability of hospital management practices supported by AI[36,54–56].

Organizational determinants also play a crucial role. The need to deal with uncertainties related to the use and integration of AI, and the ambiguity of AI contributes to distrust among professionals[57]. Thus, it is imperative that AI implementation processes be accompanied by clear and effective change management strategies, aiming to minimize organizational resistance and maximize the acceptance of technology and innovation[42,47,57].

The importance of determined top leadership can significantly minimize the current challenges of the decision-making process pointed out by managers, promoting skill development and encouraging new digital transformation projects associated with management, integrating innovation such as AI[51]. Moreover, the vision of leadership is conditioned by the perception of existing technology and thus, it is imperative that healthcare organization leaders understand the capabilities, potential, and new digital trends[42]. Collaborative intelligence, which integrates human perception and analysis with AI's computational power, emerges as an essential strategy to overcome some of the barriers mentioned[53]. In this way, it will be possible to take into account the need for active involvement of managers in AI development, ensuring that technology not only supports but also amplifies analytical capacity, creating more responsive and efficient health systems[48,53,58,59].

It is also noteworthy that perceptions of AI vary and are influenced by multiple factors, including personal experiences and organizational expectations[51,60]. In this sense, future research should explore the influence of the organizational context on the adoption and use of AI, as well as defining and identifying the necessary strategies to align new technologies with the needs and expectations of various stakeholders[43,45,57].

Through this analysis, we aim to provide a deeper understanding of current dynamics and help shape future strategies for the adoption of emerging technologies in the health management sector[44]. The implementation of AI facilitates data-driven decision-making, offering significant potential to improve management processes in healthcare facilities, which indirectly impacts the quality of the services provided, reducing disparities[61,62]. It is essential to overcome the identified challenges and maximize the significant benefits of using AI tools in the decision-making process in hospital management.

Limitations

The study coincided with a period of public interest and media coverage related to AI, particularly large language models, which may have influenced the perceptions of the interviewees. This temporal context may have favored expressions of skepticism or concern about AI technology in general.

Conclusions

The use of AI tools is one of the most promising and challenging frontiers within the health sector. Through interviews with middle and senior managers, a series of insights reflecting the current decision-making process, its challenges and limitations, and simultaneously understanding the perception of potential for change and improvement with the use of AI tools were captured. The integration of AI in hospital management is perceived by managers as a necessary and inevitable evolution that will bring various benefits in terms of efficiency, accessibility of information, and analytical capacity. However, it is essential that institutions prepare an adequate base, both in terms of data infrastructure and in the training and cultural adaptation of their professional managers, so that the benefits can be maximized and the challenges of this technological and organizational transition minimized.

This study underscores the complexity and dynamism of AI integration, pointing to a future where technology and the humanization of hospital management should advance hand in hand. Moreover, it is a fundamental step towards understanding the transformative potential of AI concerning the current decision-making process, particularly for the expectations and difficulties pointed out by managers, and simultaneously exploring how to ensure the ethical, safe, efficient, and effective integration of AI as a decision-support tool in managing health institutions.

Abbreviations

AI Artificial Intelligence

Declarations

Ethics approval and consent to participate

The study was based on original data. The authors confirm that all methods were carried out in accordance with relevant guidelines and regulations and confirm that informed consent was obtained from all participants. Ethics approval was granted by the Ethics Committee of NOVA-NSPH, Lisbon, Portugal (ID:09/2024).

Consent for publication

Not applicable.

Availability of data and materials

Data are available to investigators upon request and approval by the principal investigator of the original study.

Competing interests

The authors declare no competing interests.

Funding

This study received no funding.

Author's contributions

MA conducted data collection and composed the manuscript; JS and TM edited and critically reviewed the manuscript and provided guidance; TS provided guidance. All authors read and approved the final manuscript.

Acknowledgements

The authors thank all hospital managers who participated in the study.

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The numbering of the references in the article proposal is in accordance with the document. In the article proposal submitted to BMC Health Services Research, the references were correctly numbered according to their order in the text.

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Anexos

Anexo I – **Guião de Entrevista**

Momento Introdutório:

- Apresentação breve do estudo e dos seus objetivos.
- Informação sobre a metodologia da entrevista, duração estimada, e garantia de confidencialidade e anonimato.

Parte 1: Dados Sociodemográficos e Contexto Profissional

1. Pode começar por se apresentar (nome, categoria profissional, departamento/serviço)?
2. Qual é a sua experiência em termos de anos na gestão ou administração hospitalar?
3. Quais são as suas habilitações académicas?

Parte 2: Questões relacionadas com a tomada de decisão:

1. **Situação Atual:**
    - Como descreveria o processo atual de tomada de decisão na sua área de gestão/administração hospitalar?
    - Que ferramentas ou sistemas são atualmente utilizados para apoiar a tomada de decisão?
2. **Eficiência e Limitações:**
    - Como avalia a eficiência dos processos de tomada de decisão atuais? Existem áreas onde sente que a eficiência poderia ser melhorada?
    - Quais são as principais limitações ou constrangimentos que enfrenta nos processos de tomada de decisão atuais?
3. **Desafios e Necessidades:**
    - Quais são os maiores desafios que enfrenta na tomada de decisão enquanto gestor/administrador hospitalar?

- Baseando-se na sua experiência, que melhorias, funcionalidades ou ferramentas adicionais acha que seriam benéficas na sua prática atual?

4. **Comparação com IA:**

    - Imaginando um cenário no qual teria a possibilidade de ter apoio e acesso à informação em tempo real, de uma forma integrada, com a possibilidade que "conversar" com os dados dos diferentes sistemas internos, ou ter notificações e alertas de acordo com os dados e a informação, ou seja, um cenário com ferramentas de IA:
    - Como descreveria este tipo de cenário?
    - Que opinião tem sobre este tipo de ferramentas e funcionalidades?
    - Quais os desafios e limitações no seu dia-a-dia comparativamente à situação que identificou?
    - Consegue identificar áreas específicas onde a IA poderia ter um impacto significativo?

5. **Visão Futura:**

    - Como imagina que a gestão e administração hospitalar poderiam evoluir nos próximos anos, especialmente com a introdução de tecnologias como a IA?
    - Que tipo de formação ou preparação acha que seria necessária para integrar eficazmente a IA na gestão hospitalar?

6. **Preocupações e Expectativas:**

    - Existem preocupações específicas que tenha em relação à integração de IA na gestão e administração hospitalar?
    - Quais são as suas expectativas quanto ao impacto da IA na qualidade assistencial, e numa organização prestadora de cuidados de saúde (ex.: eficiência operacional; otimização de recursos; sustentabilidade

Conclusão da Entrevista:

- Reiterar os agradecimentos pela participação e *insights* fornecidos.
- Confirmar a confidencialidade e uso ético dos dados.
- Informar sobre a disponibilização dos resultados do estudo e como estes poderão contribuir para o campo da gestão e administração hospitalar.

Anexo II – **Modelo de pedido de Consentimento Informado**

DECLARAÇÃO DE CONSENTIMENTO INFORMADO

Por favor, leia com atenção a seguinte informação. Se achar que algo não está correto ou completamente clarificado, não hesite em solicitar mais informações. Se concorda com a proposta que lhe foi feita, queira assinar este documento

Exmo.(a) Senhor(a),

O presente estudo intitulado "**Análise da utilização de ferramentas de Inteligência Artificial no suporte à tomada de decisão na gestão e administração hospitalar**", surge no âmbito do Curso de Especialização em Administração Hospitalar da Escola Nacional de Saúde Pública – Universidade NOVA de Lisboa, e é da responsabilidade do estudante Maurício Fernandes Alves, sob a orientação da Professora Teresa Magalhães (Professora Coordenadora do CEAH da NOVA-ENSP) e coorientação da Dr.ª Joana Seringa (Investigadora da NOVA-ENSP) e da Dr.ª Tatiana Silvestre (Administradora Hospitalar).

A disponibilização de serviços de excelência que agreguem valor real aos utilizadores e à sociedade, a gestão e a qualidade clínica é um desafio constante. Há uma forte ênfase na eficiência na gestão de recursos, equidade no acesso, segurança, gestão de risco e sustentabilidade. A tecnologia clínica, especialmente a utilização de ferramentas digitais e sistemas informatizados, já é uma realidade transversal. Estas são essenciais para melhorar os cuidados de saúde e reforçar a segurança dos doentes. No entanto, a transformação digital vai além da clínica, abrangendo também a gestão e a administração hospitalar.

A necessidade de otimização de processos e procedimentos é crescente e o mercado da saúde cada vez mais exigente e competitivo. A inteligência artificial (IA), apesar da sua integração lenta nos sistemas clínicos, parece oferecer uma capacidade analítica significativa que pode melhorar a segurança e os resultados das decisões clínicas. No entanto, existe uma desconfiança entre os profissionais de saúde sobre esta tecnologia, o que exige uma abordagem cautelosa na sua implementação para garantir que não comprometa a qualidade assistencial. A investigação visa assim identificar o estado atual da tomada de decisão na gestão hospitalar, as tendências emergentes e o seu potencial

impacto da integração, a perceção dos gestores hospitalares para o tema e os desafios da integração nos processos de decisão. O estudo explora a utilização de IA na tomada de decisão na gestão e administração hospitalar, e por isso acreditamos poder gerar impacto como suporte à criação e desenvolvimento de ferramentas digitais, apoiando um futuro mais eficiente, seguro e sustentável para os serviços de saúde.

Tendo em conta as suas funções de gestão e administração hospitalar, experiência profissional e conhecimentos sobre as temáticas em estudo, solicitamos a sua fundamental participação através de uma entrevista. Seguindo a metodologia adotada, esta decorrerá num espaço reservado e condições de conforto, durante um tempo estimado de 20 minutos. A entrevista será conduzida pelo investigador e audiogravada para posterior análise. Ressalva-se que todas as informações fornecidas serão tratadas com a máxima confidencialidade e utilizadas exclusivamente para os objetivos da investigação. O acesso às gravações bem como a todos os dados resultantes, será restrito aos elementos envolvidos na investigação. Os dados serão anonimizados no momento da gravação e tratados com o máximo rigor e respeito pela privacidade dos envolvidos, em linha com os princípios éticos da investigação científica, não sendo em nenhum momento partilhada a identidade dos entrevistados.

A sua participação é voluntária, o anonimato e a confidencialidade serão salvaguardados, cabendo-lhe a decisão de participar ou desistir a qualquer momento, sem necessidade de explicação e sem qualquer consequência. Qualquer tipo de informação adicional poderá ser solicitado através do email mfa.alves@ensp.unl.pt ou pelo telefone 9[redacted]3.

Agradecemos desde já o seu contributo.

Maurício Fernandes Alves

Eu, abaixo-assinado, (nome completo do participante no estudo) _____,

declaro ter lido e compreendido na íntegra todas as informações contidas neste documento. Foi-me assegurada a possibilidade de, em qualquer altura, recusar participar neste estudo e sem qualquer tipo de consequências ou prejuízos pessoais. Desta forma, aceito participar no estudo e permito a utilização dos dados que de forma voluntária forneço, confiando que

apenas serão utilizados para esta investigação, com a garantia de confidencialidade e anonimato que me são fornecidas pelo investigador.

Pelo exposto, participo neste estudo de forma totalmente livre e esclarecida.

Data: _____/_____/2024

(assinatura do participante)

Anexo III – **Parecer da Comissão de Ética da NOVA-ENSP**

Escola Nacional de Saúde Pública
UNIVERSIDADE NOVA DE LISBOA

PARECER FINAL da CEENSP

Resposta ao pedido de parecer CEENSP nº 09/2024

Nome do Investigador

Maurício Fernandes Alves

Nome do Projeto/Tese/Dissertação/Trabalho Final

Utilização de ferramentas de Inteligência Artificial no suporte à tomada de decisão na gestão e administração hospitalar

QUADRO I

De acordo com a informação e documentos disponibilizados pelo/a(s) Requerente, sou de parecer que este projeto cumpre os requisitos éticos de investigação:	Sim	Não	Não se aplica	Observações/ Pedidos de esclarecimento/ Fundamentação
1. Com seres humanos (incluindo quando aplicável a participantes menores, incapazes ou vulneráveis)	X			
2. Com Células/ tecidos Humanos.			X	
3. Quanto à proteção de dados pessoais.	X			
4. Quanto ao envolvimento de países terceiros.			X	
5. Quanto à utilização / recurso a animais.			X	
6. Que diz respeito à proteção do ambiente, saúde e segurança.			X	
7. Com foco exclusivo em aplicações civis.			X	
8. De salvaguarda para o potencial risco de utilização indevida.			X	
9. De salvaguarda de conflitos de interesses.	X			

Parecer/Decisão:

Positivo	X
Intermédio, com pedido de esclarecimentos/alterações	
Negativo	

Fundamentação conclusiva (tendo em conta o que já foi dito no quadro I):

Descrição do estudo

- O estudo tem como objetivo explorar a utilização das ferramentas de inteligência artificial no suporte à tomada de decisão na gestão e administração hospitalar.
- A recolha de dados será efetuada através de entrevistas semiestruturadas.
- a população em estudo será constituída por gestores intermédios e de topo, administradores hospitalares, bem como gestores e diretores de serviço.
- Foi apresentado um modelo de pedido de consentimento informado.
- Foram apresentadas as questões a colocar aos participantes, as quais versam sobre, por exemplo, o processo de tomada de decisão e a utilização de ferramentas de inteligência artificial.
- Após a utilização da informação recolhida para elaboração do estudo, o documento contendo os dados pessoais dos participantes será apagado.

Sobre este estudo, consideram-se ultrapassadas as questões anteriormente levantadas.

Subsiste ainda a questão da caracterização dos participantes (que o IP considera crucial para o estudo), sugerindo-se que seja tida em consideração que a caracterização dos participantes não possa, em caso algum, conduzir à identificação dos mesmos.

O IP afirma que “Não sendo em nenhum momento partilhada a identidade dos entrevistados", o que implicará que com o cruzamento das respostas às várias perguntas de caracterização não se possa identificar o respondente (por ser um jovem diretor do serviço x, cuja denominação é única no país, por exemplo).

Ressalva:
A CE-ENSP enfatiza que a aprovação de um estudo não significa que venha a ter qualquer responsabilidade por danos ou outros atos ilícitos que possam vir a ser praticados no âmbito do mesmo. As opiniões apresentadas nas publicações, relatórios ao governo ou outros resultados desta investigação são da responsabilidade exclusiva dos investigadores.

Aprovado na reunião plenária de 13 de março 2024

A Presidente da CE-ENSP

Prof.ª Doutora Paula Lobato de Faria