ESCOLA NACIONAL DE SAÚDE PÚBLICA

Competências Essenciais dos Enfermeiros em Programas de Telemonitorização e a sua Contribuição para a Gestão dos Serviços de Saúde

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Dissertação apresentada para cumprimento dos requisitos necessários à obtenção do grau de Mestre em Gestão da Saúde, realizada sob a orientação científica do Professor Doutor João Cordeiro e da Professora Doutora Ana Rita Pedro

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Resumo

Introdução: A crescente digitalização na saúde tem transformado a forma como os serviços são prestados e como os profissionais de saúde interagem com os utentes. Neste contexto, a telessaúde emerge como um recurso essencial para garantir cuidados acessíveis e eficientes, especialmente num cenário de envelhecimento populacional e aumento das comorbilidades. Dados da OCDE revelam que os utentes estão cada vez mais dispostos a utilizar a saúde digital. A telemonitorização, como parte integrante da telessaúde, permite o acompanhamento remoto da saúde dos cidadãos, promovendo intervenções precoces e qualidade de vida, ao mesmo tempo que reduz custos para o utente e sistema de saúde. No entanto, a ausência de formação adequada para os profissionais de saúde, especialmente enfermeiros, pode comprometer a efetividade da telemonitorização.

Objetivo Geral: O objetivo da dissertação consiste em identificar as competências essenciais que enfermeiros devem possuir para implementarem eficazmente programas de telemonitorização e discutir como essas competências contribuem para a gestão eficiente de serviços de saúde, com base na literatura cientifica existente.

Metodologia: Revisão Sistemática da Literatura.

Resultados: A revisão sistemática da literatura permitiu identificar 6 competências para enfermeiros na prestação direta de cuidados, e 4 para enfermeiros gestores. Para a prestação de cuidados estas compreendem competências comunicacionais, tecnológicas, gestão de qualidade e segurança, clínicas, ético-legais e interdisciplinares. Para enfermeiros gestores, foram identificadas competências de liderança geral, comunicação e interpessoais, gestão e organização, e tecnológicas. As referidas competências englobam tarefas e atividades que os enfermeiros devem desempenhar para adquirir a respetiva competência.

Conclusão: A telemonitorização é uma ferramenta fundamental que exige novas competências para os enfermeiros. Estes precisam de desenvolver competências específicas nesta área capacitando-os a prevenir complicações, diminuir custos de saúde, reduzir hospitalizações desnecessárias e otimizar o tempo de atendimento beneficiando tanto os sistemas de saúde como os utentes.

Palavras-Chave: Telemonitorização; Enfermeiros; Competências Profissionais

Abstract

Introduction: The growing digitalization in healthcare has transformed the way services are delivered and how healthcare professionals interact with patients. In this context, telehealth emerges as an essential resource to ensure accessible and efficient care, particularly in a scenario of an aging population and rising comorbidities. Data from the OECD shows that patients are increasingly willing to use digital health. Telemonitoring, as an integral part of telehealth, allows for the remote monitoring of citizens' health, enabling early interventions and improving quality of life, while also reducing costs for the healthcare system. However, the lack of adequate training for healthcare professionals, especially nurses, may compromise the effectiveness of this approach. Thus, this dissertation aims to explore the essential competencies that nurses must possess for the effective implementation of telemonitoring programs, seeking to understand how these skills contribute to the efficient management of healthcare services.

Main Objective: The objective of the essay is to identify the essential skills that nurses must possess to effectively implement telemonitoring programs and discuss how these skills contribute to the efficient management of health services, from the existing scientific literature.

Methodology: Systematic Review

Results: The systematic review identified six competencies for nurses in direct patient care, and four for nurse managers. For direct patient care, these include communication competencies, technological, quality and safety management, clinical, ethical-legal and interdisciplinary. For nurse managers, general leadership competencies, communication and interpersonal, management and organization and technological were identified. These competencies encompass skills and activities that nurses must perform to acquire the respective competence.

Conclusion: Telemonitoring is a fundamental tool that requires new skills for nurses. They need to develop specific competencies in order to be qualified to prevent complications, reduce healthcare costs, reduce unnecessary hospitalizations and optimize care time, benefiting both healthcare systems and users.

Key Words: Telemonitoring; Nurses; Professional Competence

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Lista de Abreviaturas/ Siglas

CNTS- Centro Nacional de Telessaúde

INE- Instituto Nacional de Estatística

MESH- Medical Subject Headings

MMAT- Mixed Methods Appraisal Tool

OECD: Organization for Economic Cooperation and Development

PRISMA- Preferred Reporting Items for Systematic Reviews and Meta-Analyses

UK- United Kingdom

USA- United States of America

TIC- Tecnologia de Informação e Comunicação

Introdução

Economias, sociedades e governos pelo mundo estão a aderir às tecnologias digitais e a grande quantidade de dados gerados estão a transformar o modo como as pessoas vivem, trabalham e se relacionam entre si [1].

A crescente evolução tecnológica tem desencadeado mudanças profundas no panorama da saúde, destacando a telessaúde como instrumento essencial para a prestação de cuidados de saúde acessíveis e eficientes [1, 2].

O interesse dos utentes em saúde digital está a aumentar sendo estes a favor da utilização dos seus dados de saúde para a criação de novo conhecimento científico, melhores tratamentos e melhor gestão do sistema de saúde, desde que a sua privacidade esteja assegurada [2-5].

Apesar de os números diferirem de país para país, estima-se que uma consulta médica possa levar até 121 minutos, dos quais 37 são gastos em deslocações e 84 minutos no consultório, com apenas 20 minutos em contacto com o profissional de saúde [4, 6]. Assim, o custo de oportunidade, que valoriza o tempo do paciente com base no valor de atividades perdidas, torna-se um método relevante para estimar o custo do tempo para o paciente [5-10]. Para tal, é necessário reconhecer que determinados procedimentos de saúde podem não exigir atendimento presencial e assim inovar em opções de prestação de cuidados de saúde que reduzam a carga de tempo (ex: telemedicina) [4, 6-10]

Globalmente, a população está a envelhecer. O aumento da esperança média de vida traduz-se numa maior prevalência de comorbilidades que causam impacto significativo na qualidade de vida da pessoas e reflete-se num maior consumo de recursos, num contexto de crescentes necessidades, mas recursos limitados [11]. Portugal, segue a tendência dos indicadores dos países desenvolvidos com aumento da esperança média de vida à nascença, situado nos 82,4 anos (um ano a mais que a média da OCDE), correlacionando-se a um maior gasto por pessoa na assistência médica [3; 12]. Pelos dados do INE (Conta Satélite da Saúde e Contas Nacionais) em 2019, a despesa corrente em saúde média *per capita* representava 1982,8€, e em 2023 de 2574€, refletindo um aumento médio de 592€ por pessoa ao longo de 4 anos [3; 14] .

Em resposta, os prestadores de cuidados de saúde e decisores políticos exploram cada vez mais novos modelos de cuidados que suportem o aumento da procura por cuidados de saúde a um custo sustentável, utilizando, particularmente, a saúde digital: uso de tecnologias de informação e comunicação (TIC) para garantir a saúde e serviços

relacionados com a saúde, desde cuidados como a vigilância até à educação da população [4, 16].

A telessaúde, em Portugal, foi definida pelo Centro Nacional de Telessaúde (CNTS) como “a prestação de serviços de saúde ao cidadão ou cuidador à distância, por canais de acesso remoto baseados em tecnologia de informação e comunicação, possível de ocorrer nos vários momentos da prestação de cuidados e de integrar com a prestação de cuidados de saúde presenciais” [16].

Os conceitos de telessaúde estão subdivididos por área profissional, especialidade clínica ou tipo de serviço, como evidenciado na figura 1.

Área Profissional	Especialidade Clínica	Serviço
Telenfermagem	Teledermatologia	Teleconsulta
Telemedicina	Telenefrologia	Telemonitorização
Telepsicologia	Telecardiologia	Teletriagem
Telenutrição	Telepneumologia	Telerreabilitação

Figura 1. Conceitos de telessaúde [16]

Neste contexto, a telemonitorização emerge como uma prática inovadora que possibilita a “monitorização à distância, existindo recolha, transmissão e análise da informação de saúde, como sintomas ou parâmetros biométricos, que permitem a vigilância e acompanhamento da saúde do cidadão” [16; 17], proporcionando aos profissionais de saúde a capacidade de intervir proactivamente em situações clínicas diversas. Deste modo, a monitorização remota constituiu-se como alternativa, ou complemento, à prestação de cuidados convencional, com potencial valorização económica e social para os utentes e para os profissionais de saúde [17-20]. Em particular, a monitorização remota possibilita o seguimento de múltiplos utentes em simultâneo, detetando precocemente sinais e sintomas de descompensação clínica, possibilitando uma intervenção atempada, sem necessidade de recurso a serviço hospitalar [17]. Em paralelo, os utentes podem receber cuidados de saúde de forma imediata, num ambiente mais confortável e familiar, evitando a exposição a riscos desnecessários (tais como as infeções hospitalares), promovendo a sua participação e maior autonomia. De acordo com Temporão (2019), a poupança para os utentes gerada pela telemonitorização situa-se entre 21 a 25€/ ano em custos de deslocação ao serviço de urgência, com maior ênfase ainda nos utentes que vivem a mais de 30 Km do hospital [20].

Para o sistema de saúde, também a telemonitorização tem vantagens. Verifica-se redução do número de episódios de internamento e episódios de urgência, permitindo também poupar custos relacionados com a utilização dos serviços de saúde [20- 23].

Apesar dos benefícios dos cuidados prestados à distância através do recurso à telemonitorização, o seu rápido crescimento a nível nacional e mundial não tem sido acompanhado de formação adequada pelos prestadores de cuidados de saúde [2; 21 24; 25].

No epicentro desta revolução tecnológica na saúde, em particular na área da telemonitorização, encontra-se a figura profissional do enfermeiro, cujos diferentes papeis e responsabilidades profissionais transcendem as fronteiras tradicionais, requerendo a aquisição de novas competências profissionais específicas para enfrentar os desafios únicos impostos pela telemonitorização [18; 24; 25]. Competência pode ser definido como um conjunto de aptidões, conhecimentos e destrezas correlacionadas que permitem a um profissional agir eficazmente em determinada situação [26]. Os enfermeiros são frequentemente prestadores de primeira-linha e as suas competências devem estar alinhadas com a exigência da telemonitorização assegurando uma gestão eficaz dos cuidados de saúde prestados aos utentes [18; 24; 25].

A área de atuação dos enfermeiros abrange uma ampla área de competências, incluindo comunicação, competências clínicas, uso de tecnologia, ética e liderança [26]. Não obstante, dentro da profissão de enfermeiro, as competências variam dependendo das funções e responsabilidades associadas a diferentes funções profissionais, como as de enfermeiros na prestação direta de cuidados, e enfermeiros gestores [27].

Sem uma visão abrangente das competências em telemonitorização, todas as suas mais-valias estão comprometidas, não otimizando dos seus benefícios para os utentes, tanto na adesão ao método de prestação de cuidados e vigilância à distancia, como também na qualidade e continuidade de todo o serviço, alterando os resultados desejados [24; 25; 28].

Com a ampliação do uso da telemonitorização é imperativo compreender os requisitos específicos que moldam as competências necessárias para garantir a segurança, eficácia e qualidade dos cuidados prestados [28]. Esta investigação visa rever e sistematizar o conhecimento descrito na literatura, oferecendo uma visão aprofundada sobre os desafios e oportunidades que os enfermeiros enfrentam ao abraçar a telemonitorização, assim como os benefícios tangíveis que a aquisição de competências específicas podem proporcionar, tanto para os profissionais de enfermagem como para os pacientes.

A capacidade de adaptação a esta nova era da prestação de cuidados de saúde é crucial para a eficiência e eficácia dos serviços. Neste contexto, a presente dissertação almeja contribuir significativamente para a discussão académica sobre a necessidade de uma formação especializada e contínua para enfermeiros, destacando a sua importância no contexto da telemonitorização e, por conseguinte, na promoção de uma prestação de cuidados de saúde mais abrangente, acessível, segura e personalizada aos utentes.

Deste modo, e tendo por base esta problemática, surge a seguinte **pergunta de investigação**: Quais são as competências essenciais que enfermeiros devem possuir para a implementação eficaz de programas de telemonitorização e de que forma essas competências contribuem para a gestão eficiente de serviços de saúde?

Para dar resposta à questão de investigação, a presente dissertação define como **objetivo geral**:

- Identificar as competências essenciais que enfermeiros devem possuir para a implementação eficaz de programas de telemonitorização e, com base na literatura científica existente.

Assim sendo, define-se como **objetivos específicos**:

- Identificar e descrever, com base numa revisão sistemática da literatura, as competências essenciais necessárias para enfermeiros na implementação de programas de telemonitorização
- Diferenciar competências em telemonitorização entre enfermeiros na prestação direta de cuidados e enfermeiros gestores.
- Discutir como as competências em telemonitorização contribuem para a gestão eficiente de serviços de saúde.
- Identificar áreas para desenvolvimento no âmbito da melhoria do serviço de telemonitorização por enfermeiros.

Para responder a estes objetivos, foi realizado o estudo "*Systematic Review: Essential Competencies for Nurses in Telemonitoring Programs and Their Contribution to Healthcare Service Management"* que consiste numa revisão sistemática da literatura dirigida à análise da evidência científica sobre competências dos enfermeiros para realizarem telemonitorização e a sua contribuição para a gestão do sistema de saúde. A dissertação apresenta-se sobre o formato de artigo científico, tendo o seguinte encadeamento: Introdução; Estudo científico (artigo científico) e respetivos anexos; Conclusões e Perspetivas Futuras; Referências Bibliográficas e Anexos.

A introdução pretende apresentar um breve enquadramento bibliográfico do problema em estudo, justificando a sua pertinência/ importância científica. São descritos os objetivos gerais e específicos e a estrutura da dissertação.

Posteriormente, apresenta-se o **Estudo científico**, desenvolvido no sentido de dar resposta aos objetivos propostos, em formato de artigo científico. Estes estruturam-se com o formato de: Resumo; Palavras-Chave; Introdução; Metodologia; Resultados; Discussão; Conclusão; Referências Bibliográficas.

O **Estudo científico** está escrito em língua inglesa, uma vez que foi submetido a uma revista científica indexada, e encontra-se formatado segundo as regras da mesma.

As conclusões resumem as principais inferências e contributos para o conhecimento, que resultaram da elaboração do estudo realizado neste âmbito.

Nos Anexos, encontra-se o comprovativo da submissão do **Estudo científico**.

Estudo Científico

Essential Competencies for Nurses in Telemonitoring Programs and Their Contribution to Healthcare Service Management: Systematic Review

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Abstract

Introduction: Higher prevalence of comorbidities translates into greater consumption of healthcare resources, leading healthcare providers and policymakers to use digital health tools such as telemonitoring to support increased demand for healthcare. Nurses are at the center of healthcare delivery but need specific professional competencies to face the unique challenges imposed by telemonitoring in order to provide quality and efficient care to patients.

Objectives: This systematic review aims to identify essential competencies that nurses must acquire for the effective implementation of telemonitoring programs and their contribution to healthcare service management.

Methods: We conducted a systematic review according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. A total of 3 databases (PubMed, Scopus, Web of Science) were searched for studies published between 2001 and 2024, using established criteria. A methodological quality assessment was performed, and the results were integrated into a thematic synthesis. The identification of the essential competencies for nurses in telemonitoring programs was achieved by interpreting and aggregating the thematic synthesis results.

Results: Of the 155 identified studies, 24 met the inclusion criteria and the required quality characteristics. Reviewed studies originated from different countries and included different study designs. Identification competencies and skills in telemonitoring revealed six major competencies for direct patient care nurses: communicational, ethical and legal, quality and safety management, clinical, technological and inter-disciplinary. The essential competencies identified for the nurse manager role included general leadership, communicational, organizational and management and technological.

Conclusions: As healthcare systems prioritize accessibility and efficiency, the findings of this review support a proactive approach to specific competency-building that aligns nursing education with the context of digital healthcare delivery. This review demonstrates that acquiring telemonitoring competencies is a necessity for advancing clinical practice, shaping policies, and driving health research.

Keywords: Telemonitoring, Nurses, Professional Competence, Healthcare Management

1. Introduction

Higher life expectancy around the world translates into a greater prevalence of comorbidities that have a significant impact on people's quality of life and is reflected in a greater consumption of healthcare resources [1]. In response, healthcare providers and policymakers aim to develop new models of care that support increased demand for healthcare at a sustainable cost, particularly by taking advantage of digital health tools, which consist in the use of information and communications technologies (ICT) to guarantee health and health-related services [2,3].

In this context, telehealth has emerged as an essential instrument for providing accessible and efficient healthcare [4,5]. In particular, telemonitoring emerges as an innovative practice that enables “remote monitoring, with the collection, transmission and analysis of health information, such as symptoms or biometric parameters, which allow surveillance and monitoring of citizen’s health” [3;4-6]. This technology provides healthcare professionals with the ability to proactively intervene in diverse clinical situations [6,7]. For example, the ability to collect and analyze real-time health data through wearable devices and remote monitoring systems leads to enhanced patient outcomes and reduced hospitalizations [2-5,8,9]. In this way, remote monitoring constitutes an alternative or complement to conventional care, with potential economic and social value for users and health professionals [10].

Healthcare professionals are the center of the healthcare technological revolution. In particular, nurses play a fundamental role, which transcends traditional boundaries, requiring the acquisition of new specific professional skills to face the unique challenges imposed by telemonitoring [8;10-12]. Nurses are often the frontline providers of care, and their competencies must align with the demands of telemonitoring to ensure effective patient management and healthcare delivery [11,12].

Despite the potential benefits, the implementation and adoption of telemonitoring poses challenges related with convenience, comfort, efficiency, communication, and privacy [1, 2]. Consequently, as technology continues to evolve, there is a pressing need to identify and define the essential competencies that nurses must possess to effectively operate within telemonitoring programs [13,14]. A well-defined comprehensive set of professional telemonitoring skills, facilitates the optimization of telemonitoring benefits for users, both in terms of remote healthcare adherence, as well as in healthcare quality and continuity of the entire service [11-14]. To ensure quality and relevance, health professionals must have the necessary competencies to deliver patient-centered and efficient care, coupled

with the ability to work in teams and manage health resources wisely [15]. Delivery of high-quality, value-based care requires technical expertise and knowledge, including critical appraisal of evidence, in addition to competencies in communication, advocacy, leadership, professionalism, life-long learning, and scholarship [15].

In the nursing field, competencies encompass a wide range of areas, including clinical skills, communication, technology use, ethics, and leadership [16]. Furthermore, within the nursing profession, competencies can vary depending on the roles and responsibilities associated with different professional roles, such as those of direct patient care nurses and nurse managers [16].

As telemonitoring requires a unique combination of these competencies, it is imperative for nursing education and professional development to evolve in parallel. Given the importance of competence acquirement, nursing education must adapt to better prepare future nurses for the challenges and opportunities presented by telemonitoring [17]. Moreover, continuous professional development is crucial for practicing nurses, enabling the necessary updates on emerging technologies, best practices, and regulations within telehealth [9,13].

The objective of this systematic review is to identify and analyze the essential competencies that nurses must possess or acquire for the effective implementation of telemonitoring programs. Specifically, this systematic review aims to identify and catalog specific competencies described in the literature for nurses involved in telemonitoring, including skills and activities associated with telemonitoring technologies, interpersonal and clinical competencies, as well as to examine knowledge and training gaps related to telemonitoring competencies. Finally, our study aims to highlight areas requiring further development or research to improve healthcare service management in the field of telemonitoring.

2. Methods

We conducted a systematic review according to the Preferred Reporting Items for Systematic Reviews and Meta-Analysis guidelines (PRISMA)[18]. A total of 3 databases (PubMed, Scopus, Web of Science) was searched for empirical studies published between 2001 and 2024, using established criteria. A methodological quality assessment was performed using Mixed Methods Appraisal Tool (version 2018), and the results were integrated into a thematic synthesis. The identification nurse's competencies was done by interpreting and aggregating the thematic synthesis results.

2.1 Search Strategy

Primary study collection occurred between February and April 2024 using the following search keys and MesH (Medical Subject Headings) terms:

- **Pubmed [MeSH]:** ("Professional Competence"[Mesh] OR "Clinical Competence"[Mesh] OR "technical expertise" OR "professional skills") AND "Nurses"[Mesh] AND ("Telenursing"[Mesh] OR "Telemedicine"[Mesh] OR telemonitoring)
- **Pubmed:** ("Professional Competence" OR "Clinical Competence" OR "technical expertise" OR "professional skills") AND (“Nurses”) AND ("Telenursing" OR "telemonitoring" OR “Telemedicine”)
- **Scopus and Web of Science:** ("Professional Competence" OR "Clinical Competence" OR "technical expertise" OR "professional skills") AND (“Nurses”) AND ("Telenursing" OR "telemonitoring" OR “Telemedicine”)

2.2 Eligible Criteria

General eligibility criteria included studies published in Portuguese or English. Eligible article types were peer-reviewed original research articles employing qualitative, quantitative, or mixed methods approaches. Only studies published in indexed scientific journals with full-text access to the manuscript were considered. Publication date was not defined as eligibility criteria. Inclusion and exclusion criteria were defined according to the PICOS strategy [19], as shown in Table 1.

***Table 1**- PICOS Strategy*

PICOS Components	Inclusion Criteria	Exclusion Criteria
Population (P)	Registered Nurses and Nursing Students.	Not registered nurses or nursing students.
Intervention (I)	Studies analysing relevant nurses competencies for telemonitoring assistance practices or programs.	Studies in which telemonitoring is not specifically analysed; Studies in which telemonitoring is conducted with patients admitted to a health institution.
Comparison (C)	Not applicable.	Not applicable.
Outcome (O)	Studies that identified nurses competencies for telemonitoring. Studies that included skills related to the use of telemonitoring technologies. Studies that identified knowledge and training gaps in relation to telemonitoring competencies for nurses. Studies analysing the contribution of competencies in telemonitoring for healthcare management.	Studies that are outside the scope of nurse telemonitoring competencies and their contribution to the healthcare management.
Study Design (S)	Observational Studies (cohort, case-control, cross-sectional, prospective longitudinal studies). Descriptive studies (Case studies). Randomized controlled trials	Systematic reviews, meta-analysis, scoping reviews or narrative reviews. Commentary or perspective articles

2.3 Selection Process and Quality appraisal

Following the literature search, all identified articles were uploaded into Rayyan software which was used throughout the selection process [20]. Subsequently, all duplicates were removed. Articles were blindly screened by two independent reviewers (PVM and JVC) according to the eligibility criteria, first by analyzing the title and abstract, then by analyzing the full text. Articles whose title was indicative of meeting the inclusion criteria but had no abstract available were included in full-text screening.

Following the two stages of article selection (section according to title/abstract and selection according to full text), anonymity was lifted, and discrepancies were discussed and resolved unanimously, according to the eligibility criteria. A third reviewer (ARP) resolved disagreements between the initial reviewers regarding the selected articles.

Subsequently, selected articles were independently assessed for their quality by two reviewers (PVM and JVC). Quality assessment was performed using MMAT (Mixed Methods Appraisal Tool) version 2018 [21-24]. Following individual quality assessment, discrepancies were resolve unanimously among reviewers.

2.4 Data Extraction and Synthesis

Following Cochrane Collaboration guidelines [25] the first reviewer (PVM) extracted data from each article into a data extraction table regarding the following topics: authors, date and country of publication, study design, period of data collection, sample and settings, objectives, description of intervention and main results.

Subsequently, thematic analysis of the results was performed in the following sequential steps: Text coding, grouping codes into themes, creation of categories and construction of main categories [24,28-30]. Thematic synthesis was performed and checked by the first reviewer (PVM) and double-checked and validated by the second and third reviewers (ARP and JVC).

Text coding and construction of themes were performed by identifying the main topics presented in the descriptions of results, discussion and conclusions of the included studies and aggregating similarities between studies. Subsequently, themes were gathered in different categories, which in turn were classified as direct patient care nurse competencies and nurse manager competencies, allowing for a systematic analysis and comparison of skills relevant to each professional role.

3. Results

3.1 Included Studies

We obtained 287 references resulting from the literature search: 139 from Pubmed; 134 from Scopus; 14 from Web Of Science, of which 132 were duplicates as described in the PRISMA flow chart (Figure 1). As a result, 155 articles were eligible for title and abstract analysis. Subsequently, 84 articles were excluded for not meeting the eligibility criteria, and 71 articles were sough for retrieval for full-text screening. Fifteen articles have not been retrieved due to inaccessibility. Following full-text reading of the remaining 56 articles, 29 were excluded for not meeting eligibility criteria. All 27 selected articles were evaluated for their quality under each correspondent study category of the quality appraisal tool [31]. Quality assessment resulted in rejection of 3 selected articles due to insufficient methodological robustness (Multimedia Appendix 1). Therefore, 24 articles were selected for this systematic review [32-55]. Figure 1 illustrates the selection process, including the reasons for article exclusion, according to the PRISMA flowchart (Figure 1).

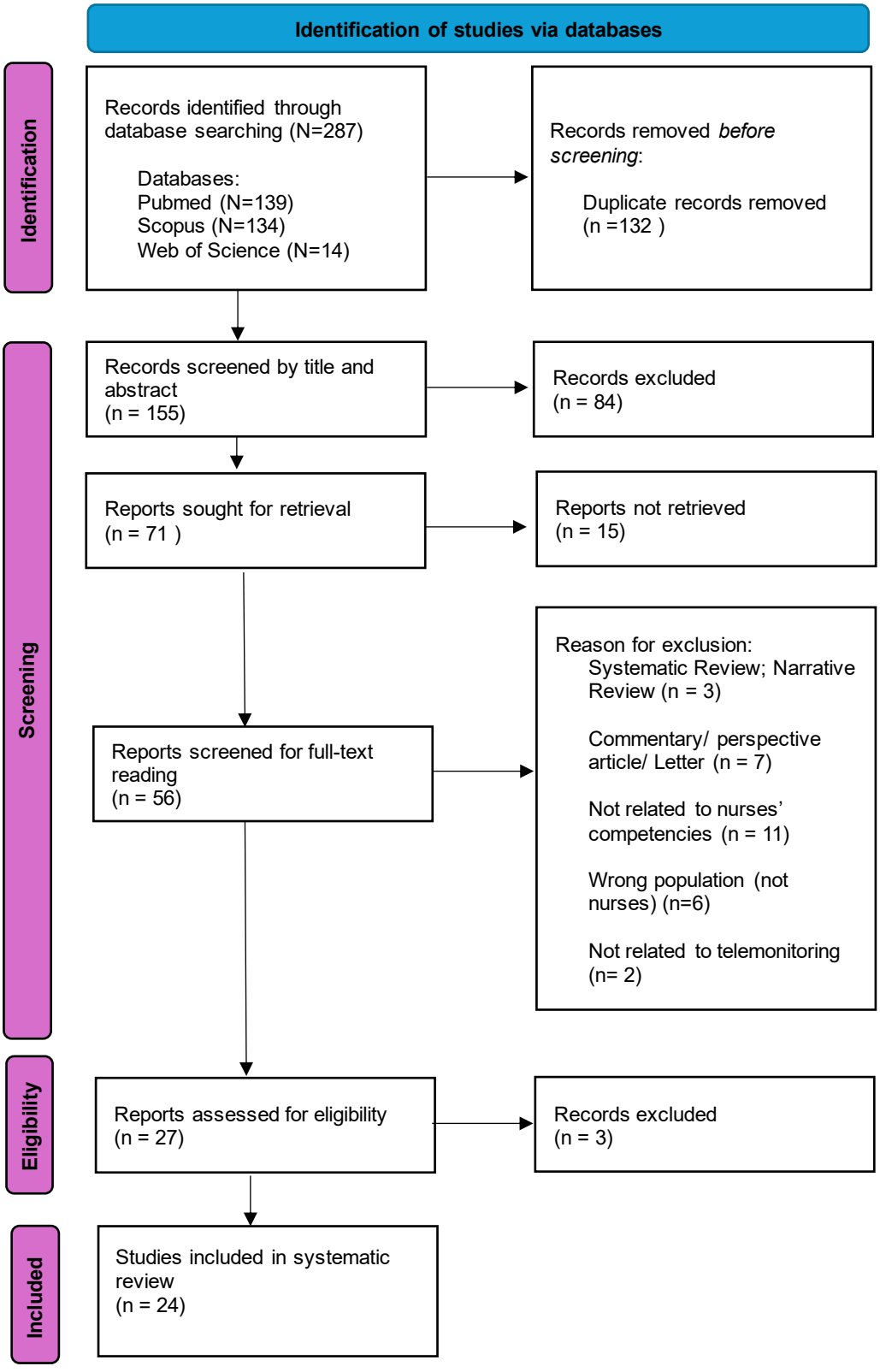

***Figure 1**- Prisma (2020) Flow Diagram*

3.2 Study Characteristics

An overview of study characteristics is provided in Multimedia Appendix 2. All articles were published in the English language and were conducted in the following countries: USA, Canada, Brazil, Indonesia, Sweden, Finland, Netherlands, Germany, UK, Italy, Spain and New Zealand.

Regarding publication date, 1 article (4,2%) was published between 2001 and 2005 [32]; 7 articles (29,2%) were published between 2006 and 2010 [37; 42; 46 48; 49; 52; 54]; 2 articles (8,3%) were published between 2011 and 2015 [36, 40); 9 articles (37,5%) were published between 2016 and 2020 [33, 35, 39, 44, 45, 47, 51, 53, 55]; and 5 articles (20,8%) were published between 2021 and 2024 [34, 38, 41, 43, 50].

The reviewed articles included different study designs. Descriptive qualitative studies accounted for the majority, with 17 articles (70,8%) [32-35,37,38,41,42,45-49,51-53,55]. One article (4.2%) was an exploratory longitudinal study [36], and two articles (8.3%) were quantitative, non-randomized cross-sectional studies [39,50]. Additionally, one article (4.2%) was a quantitative randomized controlled trial [44], and three articles (12.5%) employed mixed methods [40,43,54] (Multimedia Appendix 2).

After analyzing the reviewed articles, we identified distinct sets of competencies relevant to telemonitoring corresponding for different nursing categories: direct patient care nurse and nurse manager. These competencies will be presented separately to highlight the unique skill sets and roles associated with each nursing category.

3.3 Competencies of Direct Patient Care Nurse in Telemonitoring

We identified six different sets of competencies which, according to the reviewed literature, direct patient care nurses must acquire to provide effective telemonitoring: communication, technological, quality and safety management, clinical; ethical and legal, and inter-disciplinary. These competencies were mentioned in 22 of the 24 reviewed articles [32-36; 39-55] and are presented in Table 2.

***Table 2**: Direct patient care nurse competencies identified in the reviewed articles*

Competencies	Studies addressing competencies	Count (n)
Communication	[32; 34; 35; 39-42; 44-47; 50-53; 55]	16
Technological	[33-35; 39; 41; 44; 45; 47;50-55]	14
Quality and Safety Management	[34; 36; 39; 41; 43; 45; 47-49; 51; 52; 55]	12
Clinical	[33; 34; 39; 41; 45; 46; 48; 50; 52; 53; 55]	11
Ethical and Legal	[33; 39; 47; 50-55]	8
Inter-disciplinary	[42; 47; 50]	3

3.3.1. Communication Competencies

Communication competencies were identified in 16 articles [32, 34, 35, 39-42, 44-47, 50-53, 55] (Table 1). Specifically, in the study of remote home monitoring via telephone conducted by Pettinari and Jessopp, patient assessment was affected by the inability to observe visible signs of illness and apprehend useful information via patient observation [32]. Therefore, communication in the absence of visual cues is a crucial telemonitoring competency for nurses. Pettinari (2001), Veikkolainen et al. (2023), and Johnson et al. (2015) found that developing skills to gather and deliver information, provide advice and reassurance, and build trust and rapport were essential for the successful implementation of telemonitoring [32, 34, 40].

Specifically, communication skills aimed at assessing more complex clinical traits, such as checking quadrants of abdominal pain, temperature assessment, checking how long asthma patients can speak without taking a breath, employed in so-called caller self-tests were identified as particularly relevant [32, 52]. Associate-assisted testing was used when some tests couldn't be conducted by the caller alone, and someone may be asked to carry out activities that a health professional would ordinarily do, such as conducting physical tests (eg. modelling body location) while the caller describes the sensation [32].

Furthermore, active and selective listening has been identified as crucial competency in different studies [32, 34, 44, 46]. Given the tendency of some patients to offload and rapidly discuss multiple topics, according to the revised studies, nurses must carefully attend to the patient explanation in order to remotely identify key points and significant symptoms [32, 34, 44, 46]. Furthermore, listening for physical signs such as breathing difficulties is not only dependent on the patient or caller description but should require the nurse to actively listen over the telephone or other communication media [32, 44, 52]. Additionally, listening for background sounds, including those made by the patient or present in the environment, can help a nurse determine the context and urgency to assess the situation more accurately. [32, 40, 46].

Other studies have highlighted that communication skills are fundamental for direct patient care nurses in the context of telemonitoring, highlighting their critical role in ensuring effective patient engagement, information exchange, and remote care coordination [35; 39; 41, 42, 45, 47, 50, 51, 53, 55]

3.3.2. Technological Competencies

Technological competencies were identified as essential for effective telemonitoring in 14 articles [33-35, 39, 41, 44, 45, 47, 50-55]. Van Houwelingen et al.(2019) found that it is important for health care professionals to be able to use digital applications in patient care [39]. Nurses in particular self-reported the professional need for computer literacy [39]. Multiple reviewed studies found that skills related to the use of information technologies (IT), such as the use of the internet and a personal computer are crucial for nurses to process information quickly during telemonitoring [33-35, 39, 41, 44, 45, 47, 50-54].

Van Houwelingen et al. (2016) and (2019), de Souza et al. (2019) and Jiménez-Rodríguez et al. (2020) found that nurses should be well-informed about the various telemonitoring platforms used in clinical practice, including software, applications, and data management systems that allow for remote patient monitoring [33, 35, 39, 44]. Furthermore, training should include navigating interfaces, accessing health reports, and communicating with patients through the chosen platform [33, 35, 39, 44].

Statton et all., (2016) identified the need for nurses to be confident and feel at ease in using the technology and knowing how to deal with technical problems [47]. This study also identified that competence in operating remote monitoring devices is critical, involving an understanding of how to use equipment such as blood pressure monitors,

glucose meters, pulse oximeters, and other devices that capture patients' biometric data [47].

De Souza et al. (2019), Jiménez-Rodríguez et al. (2020), and Statton et al. (2016), also highlighted that it is important to understand how to connect these devices to telemonitoring systems and to ensure that data is transmitted accurately [39, 44, 47]. Statton et al. (2016) specify that training in health data analysis can be beneficial in developing this skill, helping nurses to make more informed decisions about essential interventions [47]. Furthermore, different studies highlight that nurses should be capable of addressing technical problems during telemonitoring, including knowing how to resolve connection failures or device malfunctions, and developing a solution-oriented mindset and basic IT skills to minimize disruptions in care [44, 47, 50-54].

Finally, nurses must master virtual communication skills, which differ from in-person interactions, a skillset which includes knowledge of how to optimize lights, image, sound and non-verbal language when collecting data during a video-conferencing interaction [33, 35, 47, 50, 51-54].

3.3.3. Quality and Safety Management Competencies

Several reviewed studies regarded telemonitoring as innovative and potentially beneficial in the delivery of health care as long as it was presented to patients as an optional rather than essential part of their healthcare plan, supplementing rather than replacing traditional health care [34, 36, 39, 41, 43, 45, 47-49, 51, 52, 55]. According to Mattisson et al. (2024), nurses also viewed telemonitoring as a chance to increase their clinical knowledge and skills and gain greater freedom to make decisions about patient care [41]. The studies from MacNeill et al. (2014), Van Houwelingen et al. (2019), Susanti et al. (2022), and Honey and Wright (2018), reported that telemonitoring can enable nurse's professional development and expertise, such as improving the ability to understand trends in the management of long-term and acute conditions [36, 39, 41, 45]. According to some reviewed studies, the basic education of health care professionals should promote a mindset that leads to innovation and the improvement of practices [41, 47-49, 51, 52].

3.3.4. Clinical Competencies

Clinical skills were identified as relevant for the practice of telemonitoring in 11 of the reviewed articles [33, 34, 41, 45, 46, 48, 50, 52, 53, 55]. Specifically, the ability to analyze

and interpret data from monitoring devices was widely mentioned as a skill that should be acquired by nurses [33, 34, 41, 45, 46, 48, 50, 52]. According to Honey and Wright (2018), prior contact with the situation or area that is being telemonitored is essential for nurses. This means that having a good knowledge and experience in the clinical specialty to be monitored is a valuable skill for nurses [45]. This study also identified that previous professional experience in providing nursing care constitutes a facilitating factor for assessing patients' signs and symptoms remotely [45]. Therefore, the combination of previous clinical experience with experience in using telemonitoring technologies constitutes an advantage for collecting and monitoring clinical data remotely, enabling these professionals to adapt more quickly [45, 52].

Kaminsky et al. (2009) described three important clinical abilities: assessing, referring and giving advice to patients. These include searching for clues such as expressions of anxiety or sounds like coughing or breathing, while remaining calm and allowing the caller sufficient time to speak. Supporting the caller involves maintaining contact during a work shift by calling back and checking on recovery following an initial advice. Strengthening the caller includes acknowledging and giving credit for self-care actions that have been performed [52].

According to several reviewed studies, building a strong nurse-patient relationship is also an important clinical skill to develop [41, 45, 46]. Van Houwelingen et al. (2016) and Veikkolainen et al. (2023) further add that patient confidence is promoted when there is trust that the nurse is knowledgeable and skilled in understanding and assessing the caller´s concerns [33,34]. Displaying friendliness, empathy, politeness and openness was identified as important for nurses in telemonitoring [53]. Additionally, careful listening, collaboration, and clarity were highlighted as behaviors of a caring nurse [33, 34, 41, 45, 46].

Stacey et al. (2016) reported that after following a telemonitoring teaching protocol, nurses improved their knowledge and coaching skills without adversely affecting the length of the calls. In this study, nurses in the intervention group were more likely to assess the callers´ decisional needs (e.g. knowledge, values clarity, support) and tailor their coaching appropriately [48].

3.3.5. Ethical and Legal Competencies

Eight studies address ethical and legal competencies for nurses in the context of telemonitoring. [33, 39, 47, 50, 51, 53-55]. The studies conducted by Van Houwelingen et al. (2016) and Holmström (2007) refer the nurses should have knowledge of the laws and regulations concerning the protection and exchange of medical data [33, 54].

Specifically, talking through a third party and discussing personal and sensitive problems over the phone constitute risks that are considered in laws and regulations [33, 47, 51, 54]. Additionally, van Houwelingen et al. (2019) and Yliluoma (2020), highlight the importance of adopting an ethically correct attitude during videoconferencing, underlining the importance of values such as honesty, confidentiality, and personal and professional integrity [39, 53]. Moreover, studies from Segato (2017), and Thye et al. (2018), indicated that the knowledge of policies, procedures, and protocols of the organization concerning the deployment of telehealth technologies are also key [51, 55]. Finally, proper processes for obtaining informed consent for telemonitoring were considered fundamental for maintaining trust between patients and healthcare providers [33, 39, 47, 53, 54].

3.3.6. Inter-disciplinary Competencies

Other reviewed studies highlighted the relevance of cooperation between healthcare professionals, mainly between doctors and nurses, to improve the quality of care provided in the context of telemonitoring [42; 47, 50].

Some positive nurse skills in this context, as perceived by doctors, are related to their ability to supply the appropriate clinical component of patient care. This includes performing correct patient assessments before calling and demonstrating a willingness to retrieve additional patient information whenever necessary [42; 47]. Respect for the other party's time and resources, demonstrated for example by minimizing interruptions, clustering calls and only contacting physicians when necessary was also mentioned as relevant competencies in the analyzed studies. Additionally, demonstrating a collaborative attitude was also highlighted, avoiding a demanding tone towards physicians and acknowledging that physicians may not be familiar with the patient, which requires that nurses provide contextual information [42, 47, 50].

Direct Patient Care Nurse´s Telemonitoring competencies and respective themes and examples are summarized in Table 4.

3.4 Nurse Manager Competences in Telemonitoring

We identified four sets of competencies that, according to the reviewed literature, nurse managers must have or acquire to provide effective telemonitoring: general leadership; communication and interpersonal; organizational and management; and technological. These competencies were mentioned in 2 of the 24 reviewed articles [37;38] (Table 3).

***Table 3**: List of Nurse Manager Competencies identified in the reviewed articles*

Competencies	Studies addressing competencies	Total Count (n)
General Leadership	[37; 38]	2
Communication and Interpersonal	[37; 38]	2
Organizational and Management	[37; 38]	2
Technological	[37; 38]	2

3.4.1. General Leadership Competencies

Thematic analysis identified three key factors within the domain of general leadership competencies. Firstly, Myllymäki et al. (2022), described a set of relevant characteristics and attitudes of frontline leaders in the context of telemonitoring [38]. These include leaders being credible and easily accessible, tolerant of feedback, and displaying a positive attitude towards helping patients and supporting the staff. The ability to influence their team towards achieving objectives and address negative skepticism also contributed to promoting a more positive atmosphere within the work unit regarding telehealth [38]. More specifically, Myllymäki et al. (2022) show that leadership competencies also include the ability to manage professional competence. This includes a nurse leader´s capacity to assess the competence of other team members, ensuring its maintenance, organize training and facilitate learning within the team [38]. Participants in the study by Payette et al. (2010) highlighted the highly political nature of this role, suggesting that leaders must be aware about the political issues affecting specific regions within the network [37]. Both studies also analyzed skills related to advocating for telehealth and telemonitoring policies at organizational and community levels, as well as promoting access to technology and resources for patients [37, 38].

3.4.2 Communication and Interpersonal Competencies

The studies conducted by Myllymäki et al. (2022) and Payette et al. (2010), identified communication as one of the core competencies of the role of nurse manager [37, 38]. More specifically, developing effective communication with the nursing team and other healthcare professionals was emphasized in both studies [37, 38]. Myllymäki et al. (2022)

highlighted the importance of having a common language, noting that leaders should be able to speak and write in both English and French in countries with different language-speaking regions [37]. Myllymäki et al. (2022) also showed that skills related with the development of educational material and programs for patients and families concerning the use of telemonitoring technologies and best practices for health management was a relevant factor in for the nurse manager role [37].

This competency extends to mentoring and supporting nursing staff as they adapt to new technologies and practices, thereby promoting professional development and continuous learning [37, 38]. Finally, both Myllymäki et al. (2022) and Payette et al. (2010) indicated that conflict management and challenge resolution are critical skills for this role as they facilitate effective problem-solving [37, 38].

3.4.3 Organizational and management Competencies

In the studies conducted by Myllymäki et al. (2022) and Payette et al. (2010), ensuring and promoting quality were identified as some of the most important skills for this role. Their findings highlighted the ability to define and achieve goals, evaluate the effectiveness, assess activities and support operational development [37, 38]. Additionally, the authors refer that nurse leaders should be competent in planning, executing, and evaluating telemonitoring projects, including resource allocation, budgeting, and timeline management [37, 38].

Payette et al. (2010) highlighted the importance of cooperation with different healthcare professionals, digital experts and other experts from the service industries, such as home care service counselors. This cooperation was critical for determining the suitability of patients for telemonitoring [38]. Sharing information in team-meetings and promoting intra-unit and cross-organization cooperation were identified as additional ways to enhance cooperation [38].

Finally, both Myllymäki et al. (2022) and Payette et al. (2010) noted that implementing strategies, such as developing organizational service policies, developing guidelines for individual telemonitoring sessions, applying strategic goals within the unit and improving continuity and coordination were essential components of the organizational and management competencies [37, 38].

3.4.4 Technological Competencies

Myllymäki et al. (2022) reported that knowledge of available and suitable technologies, as well as their functioning is essential for the nurse manager role. More specifically, this includes an understanding of telemonitoring technologies such as the various telemonitoring platforms, devices, and software applications used in both clinical and home settings [37]. The authors also noted the importance of competence in managing and analyzing data collected through telemonitoring systems, which enables informed decision-making and improved patient outcomes [37].

Telemonitoring competencies of nurse mangers and respective themes and examples are summarized in Table 4.

***Table 4**: Nurse's telemonitoring competencies and respective themes and examples*

Professional Role	Competencies	Themes	Examples
Direct Patient Care Nurse	**Communication**	**Patient Assessment**	• Performing caller self-tests • Performing associate-assisted testing when some tests couldn't be conducted by the caller alone • Listening for physical signs such as breathing difficulties • Listening for background sounds to determine context and urgency
		Information, Advice and Reassurance delivery	• Improving interview technique • Active and selective listening considering the tendency of some patients to offload and rapidly discuss multiple topics
		Trust and Rapport building	• Recognizing and managing the patient's emotions • Generating trust
	Technological	**Technological know-how**	• Effectively using digital applications in patient care • Developing computational literacy • Using the internet and/or a personal computer to quickly process information • Developing confidence and easiness in using the technology and knowing how to deal with technical problems • Understanding how to connect devices to telemonitoring systems and ensuring that data is transmitted accurately • Addressing technical problems during telemonitoring, including resolving connection failures or device malfunctions

		Parameter Interpretation	• Acquiring information about the various telemonitoring platforms used in clinical practice, including software, applications, and data management systems that allow for remote patient monitoring • Training in health data analysis to make more informed decisions about essential interventions
		Patient training for equipment use	• Training in navigating interfaces, accessing health reports, and communicating with patients through the chosen platforms • Developing a solution-oriented mindset and basic IT skills to minimize disruptions in care
		Virtual Communication	• Optimizing lightning, image, sound and non-verbal language when collecting data during a video-conferencing interaction
	Quality and Safety Management	**Clinical knowledge and skills**	• Increasing clinical knowledge and skills to gain autonomy to make decisions about patient care
		Professional development and expertise	• Promoting professional development and expertise • Improving the ability to understand trends in the management of long-term and acute conditions
		Innovation and Practice Improvement	• Promoting a mindset that leads to innovation and the improvement of practices through basic education of health care professionals
	Clinical	**Data analysis and interpretation**	• Improving data analysis and interpretation from monitoring devices
		Specialty knowledge and expertise	• Improving knowledge and experience in the clinical specialty to be monitored

		Previous Experience	• Prior contact with the situation or area that is being telemonitored • Previous professional experience in assessing patients' signs and symptoms remotely
		Patient referencing and advice	• Maintaining contact during a work shift by calling back and checking on recovery following an initial advice • Promoting confidence and trust by assuring the nurse is knowledgeable and skilled in understanding and assessing the caller´s concerns • Carefully listening, clarifying and collaborating
		Caller support	• Giving credit for self-care actions that have been performed • Displaying friendliness, empathy, politeness and openness
	Ethical and Legal	**Data protection**	• Acquiring knowledge of the laws and regulations concerning the protection and exchange of medical data
		Mediated communication	• Obtaining information from organization's protocols, procedures and policies concerning the deployment of telehealth technologies
		Sensitive issue discussions via phone	• Displaying honesty, confidentiality, and personal and professional integrity • Obtaining informed consent for telemonitoring
	Inter-disciplinary	**Cooperation between different healthcare professionals**	• Improving the quality of care provided in the context of telemonitoring through cooperation between doctors and nurses • Performing correct patient assessments before calling
		Collaborative attitude	• Demonstrating a willingness to retrieve additional patient information whenever necessary • Minimizing interruptions, clustering calls and only contacting physicians when necessary • Avoiding a demanding tone towards physicians and acknowledging that physicians may not be familiar with the patient

Nurse Manager	**General Leadership**	**Essential leadership traits and attitudes**	• Being credible and easily accessible, tolerant of feedback, and displaying a positive attitude towards helping patients and supporting the staff
		Professional competence management	• Influencing their team towards achieving objectives and addressing negative skepticism, promoting a more positive atmosphere within the work unit • Assessing competence of other team members, ensuring its maintenance, organizing training and facilitating learning within the team
		Policy and regulatory environment advocacy	• Being aware of the political issues affecting specific regions within the network • Advocating for telehealth and telemonitoring policies at organizational and community levels • Promoting access to technology and resources for patients
	Communication and interpersonal	**Effective communication**	• Developing a common language • Speaking and writing in different languages in countries with different language-speaking regions
		Patient and family education	• Developing educational materials and programs for patients and families concerning the use of telemonitoring technologies
		Mentorship and support	• Mentoring and supporting nursing staff as they adapt to new technologies and practices
		Conflict resolution	• Facilitating effective problem-solving via conflict management and challenge resolution
		Quality assurance and promotion	• Defining and achieving goals, evaluate the effectiveness, assess activities and support operational development

	Organizational and Management	**Cooperation promotion**	• Determining the suitability of patients for telemonitoring through cooperation with different healthcare professionals, digital experts and other experts from the service industries
		Strategy implementation	• Planning, executing, and evaluating telemonitoring projects, including resource allocation, budgeting, and timeline management • Developing organizational service policies, developing guidelines for individual telemonitoring sessions, applying strategic goals within the unit and improving continuity and coordination
	Technological	**Telemonitoring technologies understanding**	• Acquiring knowledge of available and suitable technologies, as well as their functioning • Understanding of telemonitoring technologies such as the various telemonitoring platforms, devices, and software applications used in both clinical and home settings
		Data management and analysis	• Managing and analyzing data collected through telemonitoring systems, which enables informed decision-making and improved patient outcomes

4. Discussion

This systematic review aimed to identify and list specific competencies for nurses in telemonitoring as described in the literature and to examine knowledge and training gaps in relation to telemonitoring competencies for nurses, highlighting areas that require further development or research. Through thematic analysis, we identified essential competencies for nurses in telemonitoring programs. According to the reviewed literature, direct patient care nurses should possess competencies in communication, technology, quality and safety management, clinical practice, ethics and law, and interdisciplinary collaboration. Conversely, nurse managers require competencies in leadership, communication and interpersonal skills, organizational management, and technology.

Despite identifying these competencies, our review also highlights their lack of empirical validation. While qualitative studies dominate the literature, quantitative evidence linking specific skills to patient outcomes, such as reduced hospitalizations or improved self-management, remains sparse. Notably, over 70% of the studies included in this review relied on qualitative designs. While valuable for capturing nuanced experiences, the absence of quantitative data limits the ability to assess the direct impact of these competencies on key healthcare outcomes such as cost savings, mortality rates, and hospital readmissions as has been argued in other settings [56; 57]. Furthermore, most studies originate from high-income countries, limiting insights into telemonitoring's applicability in resource-constrained settings.

One of the primary findings of this review is the necessity for nurses to develop robust communication competencies. Developing connections and establishing relationships with health professionals and patients are known to form the foundation of quality health care, with communication serving as a cornerstone of effective relationships. This is equally true in the context of telehealth [57-62]. For direct patient care nurses, successful telemonitoring depends heavily on effective communication between nurses and patients [32, 34, 35, 39-42, 57-63]. The findings indicated that many nurses recognized the importance of patient assessment [32, 34, 35, 39-42, 40-44, 52]. Arriving at an assessment by 'building a picture' of the patient and their environment has been well-documented in telephone nursing [58]. Given this fact nurses engage on a range of collaborative activities that they perceive to help patients precisely describe what the

nurses cannot see [32]. Specifically, a randomized controlled trial by Young et al. (2020), found that a nurse coaching program using motivational interviewing and mHealth technology improved diabetes self-efficacy and self-management in the short term (<9 months) [64]. This aligns with our findings that nurses must employ active listening, empathy, and clarity to build rapport [31, 34, 40]. Similarly, Camparoto et al. (2024) reported that nurses perceived telemonitoring as beneficial for managing type 2 diabetes and hypertension [65].

Communication competencies include conveying complex medical information in an understandable manner, simplifying jargon and explaining procedures or treatment plans clearly, particularly in a virtual environment [66, 67]. Our findings align with the Health Literacy Universal Precautions Toolkit (AHRQ, 2020), which recommends assuming patients have limited health literacy to ensure clarity [68]. Therefore, training programs should prioritize not only technical skills but also adaptable communication strategies for virtual care. Strengthening these skills can improve patient engagement, treatment adherence, and overall satisfaction [32, 34, 39, 40, 44-47]. For nurse managers, effective communication is also essential, including engaging with patients and families, tailoring care, and providing education on telemonitoring technologies [38, 67]. This is further supported by the importance of English and French proficiency mentioned in the study by Payette et al. (2010) [69], which likely reflects the Canadian context where both languages are spoken.

The ethical and legal dimensions of telemonitoring are complex, requiring nurses to balance patient autonomy, data security, equity, and adherence to evolving regulations [33; 39; 47; 50-55]. In different studies, nurses expressed concerns regarding patient privacy and data security in telemonitoring practices [33, 38, 47, 50, 51, 53-55]. Therefore, as telemonitoring involves the transmission of sensitive personal health information, it is imperative that nurses understand the ethical framework and legal regulations governing telehealth in their context [70, 71]. This remains valid despite variations in regulatory contexts worldwide [56]. To address this variation competence relevance should be assessed in alignment with international frameworks, such as those provided by the International Council of Nurses (ICN) [56]. In particular, cybersecurity breaches in telehealth rose by 55% between 2020 and 2023, highlighting nurse's critical role in protecting patient data [72]. For instance, a 2021 UK NHS telemonitoring breach exposed 50,000 patient records due to misconfigured cloud storage, prompting mandatory quarterly cybersecurity audits for nurses [73]. Legal documents like GDPR in the European Union require nurses to ensure that only essential clinical data is collected

[74], while HIPAA in the USA mandates compliance with encryption standards [75]. Training programs, such as Portugal's Cibersegurança SNS, offer guidelines to strengthen nurses' cybersecurity practices [76]. Furthermore, the use of personal devices for telemonitoring increases the risk of inadvertently sharing sensitive information on unsecured platforms. Therefore, nurses should promote the use of secure technologies and educate patients on privacy best practices, including password protection and recognizing phishing attempts [75, 77]. This is true despite global variation of regulatory context [56]

Quality and safety management in telemonitoring is an increasingly important area in nursing, especially as healthcare continues to integrate technology into patient care [34; 36; 39; 41; 43; 45; 47-49; 51; 52]. As identified in this systematic review, the ability to assess patients virtually, to understand how to ask the right questions, to interpret non-verbal cues through video consultations or messaging, to recognize abnormal readings from monitoring devices and to know when to escalate concerns to physicians or other healthcare professionals are fundamental skills for professional autonomy in the context of telemonitoring [34, 36, 39, 41, 43, 45]. In parallel, engaging in quality improvement initiatives and contributing to the development of evidence-based protocols is also crucial for promoting patient safety [38, 41, 43].

Regarding professional experience, Honey and Wright (2018) found that most nurses viewed prior knowledge in a specialty as essential for developing confidence and competence in telehealth [45]. Previous literature debated the level of nursing practice required, with Grady and Schlachta-Fairchild (2007) arguing that telehealth was unsuitable for new graduates and should be considered advanced practice [79], while Carter et al. (2007) advocated for integrating telehealth into undergraduate nursing education [80]. More recently, Honey and Wright (2018) reported a general consensus that newly licensed nurses should not begin their practice in telehealth services [45]. As telehealth services expand and academic curricula adapt, this idea should be continuously probed and researched. According to nurse's perspectives additional skills in telemonitoring are required, including advanced physical assessments, patient referrals, and remote advice provision [45, 52]. Dorsey et al. (2020) highlighted that experienced nurses can detect subtle changes in patient conditions by interpreting telemonitoring data trends, such as variations in heart rates [81]. Similarly, Tucker et al. (2017) found that nurse-led telecounseling and education contributed to reduced blood pressure in self-monitored patients [82]. Furthermore, a randomized controlled trial by Dawson et al. (2021) showed that nurse-led telemonitoring interventions, including vital

sign monitoring, follow-up calls, teach-back education, and medication reconciliation significantly reduced hospital readmissions among high-risk patients [83].

Technological competencies are essential for both direct patient care nurses and nurse managers, although with distinct applications. For direct care nurses, proficiency in using and troubleshooting telemonitoring technologies such as vital sign monitors, wearable devices, and mobile health applications is crucial [47]. Additionally, training patients to properly use these devices is a key competency identified in this review [44, 47, 50-54]. This is supported by a randomized controlled trial by Indraratna et al. (2022), which found that patients with acute coronary syndrome or heart failure had fewer readmissions over 6 months, improved medication adherence, and better cardiac rehabilitation completion when trained by nurses or doctors to correctly use telemonitoring devices before hospital discharge [84]. A qualitative study by Ekstedt et al. (2023) found that telemonitoring in home care improved patient's sense of safety and security when healthcare professionals effectively processed health data and adapted care according to both device functioning and patient behavior [85]. This aligns with our findings on nurses' data interpretation skills, as understanding of telemonitoring devices enables nurses to distinguish between abnormal readings caused by improper use or technical malfunctions versus clinical issues, ensuring appropriate action. As for nurse managers, key competencies include understanding telemonitoring technologies to allocate resources effectively and support staff in troubleshooting technical issues as highlighted by Koivisto et al. (2019) and Kujala et al. (2018) [86, 87].

This review highlights that data management and analysis are critical competencies for nurse managers [61, 62]. This can be important for two reasons. First, analyzing patient records enables nurse managers to develop and implement strategic telemonitoring plans aligned with organizational goals and patient needs. This is supported by Jeffs et al. (2014) who found that nurse leaders require real-time data to guide decision-making and monitor patient outcomes [88]. Second, evaluating nurse´s performance data allows managers to implement quality improvement initiatives focused on the staff´s needs, thereby promoting professional development, patient safety and telemonitoring experience as noted in different studies [89-91].

Effective collaboration within a multidisciplinary healthcare team is essential for ensuring high-quality patient care, particularly through sharing monitoring data and insights for better care planning [42, 47, 50]. This review identified three key interdisciplinary competencies for nurses: cooperation between healthcare professionals (especially between nurses and doctors), maintaining a collaborative attitude, and avoiding a

demanding tone. Other studies support these findings. McLaney et al. (2002) developed the Sunnybrook competency framework for hospital-wide implementation to establish a shared language for collaboration across roles and settings, promoting consistent team expectations [92]. Similarly, Van Diggele (2020) found that early interprofessional education improves leadership, teamwork, and communication, ultimately promoting patient safety [93]. Additionally, Van Staalduinen et al. (2023) reported that in a value-based healthcare organization, strong collaboration and integration between medical specialists and nurses was linked to high-quality interactions, influenced by organizational structures, role awareness, and communication strategies [94].

This review identified general leadership competencies essential for nurse managers and their role in promoting team competence, resource allocation, advocacy, and mentorship. Leading by example is a key trait as nurse managers' behavior directly influences the competence of other healthcare professionals [95]. In parallel, others have shown that leaders must allocate time and resources to support knowledge-sharing and competence development, aligning with our findings that nurse managers should assess team competency, guarantee proper training, and facilitate learning opportunities [37, 38, 96, 97]. Additionally, human, material, and logistical resources in maintaining telehealth services are fundamental, which reinforces the need for nurse managers to understand organizational structures and collaborate with network leaders [37, 98]. A crucial leadership skill is advocating for better telehealth policies and regulatory environments, which can promote patient access to technology and guarantee continuity and coordination of care [99]. Finally, mentorship is vital for guiding and supporting less experienced staff and encouraging professional growth. Studies indicate that nurse managers should actively offer support, share knowledge, and provide constructive feedback while serving as ethical role models [99-102].

Conflict can arise in telemonitoring environments due to misunderstandings, differences in professional opinions, or varying levels of experience among team members. Effective conflict resolution is essential for maintaining a collaborative atmosphere and ensuring that patient care is not compromised [37, 38]. Nurse managers should also be able to recognize early signs of conflict, such as shifts in team dynamics, communication breakdowns, or decreased morale. Mediation skills have been shown to be important in this context, enabling managers to guide discussions, promote active listening, and find common ground for resolution [103]. Additionally, other studies highlight that promoting a culture of open dialogue encourages effective teamwork [104, 105].

Overall, the development of diverse competencies is critical for nurses to provide high-quality, safe, and effective care in telemonitoring contexts. By integrating these skills, nurses can enhance their roles in telemonitoring, actively contribute to interdisciplinary teams, and improve health outcomes for patients receiving remote monitoring. As telemonitoring continues to evolve, continuous education and training will be necessary.

Strengths and limitations

This systematic review synthesizes evidence from a significant range of studies, providing a comprehensive perspective of the competencies required for nurses in telemonitoring. The findings are structured and grounded in empirical evidence, making them more reliable and relevant for decision-making in clinical practice, education, healthcare management and health policy formulation. This review was structured and guided according to PRISMA guidelines and the data extraction guidelines proposed by the Cochrane Collaboration, which are essential tools for summarizing evidence accurately and reliably. The results may contribute to the establishment of a standardized framework of competencies for nursing practice in telemonitoring, supporting the design of training programs and professional development initiatives.

However, limitations of this review should be acknowledged. The global variation in nursing practice, education, and regulatory landscape might mean that the identified competencies may not be universally applicable. Furthermore, contextual factors such as institutional policies, and the specific needs of diverse patient populations also impact telemonitoring practices. Moreover, the rapid evolution of healthcare technology may result in changes in necessary telemonitoring competencies, making it essential to periodically update this review. The studies included in this systematic review originate from 12 different countries, which requires adaptation of these findings to specific national contexts. Additionally, as telemonitoring is implemented across different healthcare settings, the heterogeneity of study designs, methodologies, and populations requires careful extrapolation of results. Moreover, some reviewed studies focused on healthcare professionals in general, rather than nurses specifically. Consequently, the review required adjustments to extract nurse-specific competencies, which may introduce applicability limitations. It cannot be completely excluded the possibility of errors in coding during data input, analysis and interpretation of the reviewed articles. This systematic review relied mainly on a synthesis of qualitative evidence leading to possible interpretation biases. This limitation was mitigated by carrying out an

assessment of the quality of the articles. However, the results are not entirely free of human judgment. To address these limitations, we recommend regular updates to this systematic review with the latest research and conducting nursing-specific studies in the future to validate telemonitoring competencies. Future research should also incorporate diverse methodologies, combining qualitative and quantitative approaches to strengthen the evidence base.

Implications of the results for clinical practice, policy, and future research

The integration of telemonitoring is transforming nursing clinical practice, requiring targeted training programs to provide nurses with essential competencies. According to the results of this review, these programs should focus on communication skills, technological proficiency, clinical decision-making, and ethical considerations specific to remote patient care. Additionally, considering these results, nurse's clinical practice in remote home monitoring contexts should be supported by interoperable digital platforms for patient records, ensuring integration with other clinical information systems. This facilitates efficient data use, improves care coordination, and optimizes patient outcomes.

This review also highlights the importance of standardized clinical protocols and checklists in telemonitoring to ensure consistent, evidence-based nursing practice. By minimizing variations in care, these tools promote predictable and reliable patient outcomes while aligning telemonitoring practices with current clinical guidelines. Additionally, they can serve as valuable training resources, helping nurses develop key competencies such as data interpretation, communication, and clinical decision-making.

This review highlights the need for health policies that support ongoing training and competency development for nurses in telemonitoring. Since the effectiveness of telemonitoring depends on proper professional preparation, policymakers should establish guidelines that prioritize continuous education in information technology, clinical practice, ethics, and communication specific for telemonitoring contexts. To encourage professional development policies, career advancement opportunities and professional certifications for nurses engaged in telemonitoring training could be considered. Additionally, developing standardized competency frameworks could be integrated into national and international nursing curricula.

This review also highlights the importance of interdisciplinary collaboration, emphasizing the need for policies that promote collaborative environments among healthcare professionals.

This review opens up different opportunities for future research. Future studies should focus on evaluating the effectiveness of different training approaches for nurses working with telemonitoring, identifying which methods are most effective in practice. Additionally, research on the impacts of telemonitoring on patient experience and the operational efficiency of healthcare institutions will be fundamental. Furthermore, research should further explore impacts of telemonitoring on vulnerable populations and rural areas where access to healthcare services is often limited.

This review demonstrates that acquiring telemonitoring competencies is a necessity for advancing clinical practice, shaping effective policies, and driving health research. A proactive focus on education and training is essential to ensure that telemonitoring continuous to be a safe, efficient, and patient-centered component of modern healthcare.

5. Conclusion

The increasing demand for efficient and accessible healthcare services, particularly in an increasingly digital world, highlights the importance of telemonitoring in nursing practice. This mechanism not only allows for closer and continuous monitoring of patients but also contributes to the optimization of healthcare resources, facilitating more personalized and effective care. However, nursing professional practice in this paradigm of care, requires specific competencies that go beyond traditional technical knowledge. Telemonitoring redefines traditional nursing roles, demanding a synergy of clinical expertise, technological fluency, and adaptive communication strategies. However, its success ultimately depends on systemic support, including creating standardized protocols, interdisciplinary collaboration, and institutional investments in continuous professional development. As healthcare systems prioritize accessibility and efficiency, the findings of this review support a proactive approach to competency-building that aligns nursing education with the context of digital healthcare delivery while safeguarding ethical standards and patient-centeredness.

In conclusion, this systematic review highlights that telemonitoring depends on technological adoption coupled with the cultivation of nurse competencies, including communication, technological, quality and safety, clinical, ethical and legal, interdisciplinary, for direct patient care nurses; and general leadership, communication and interpersonal, organizational and technological for nurse managers. By identifying distinct skill sets for direct patient care nurses and nurse managers, this study bridges a gap in the literature, offering a structured basis to guide future education, practice, policy and research initiatives.

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Author contribution

PVM contributed to the study design, selection process, data extraction, conducting and verifying the thematic synthesis, interpreting the results of the thematic synthesis, and to drafting the article.

ARP contributed to the study design, selection process, quality assessment of the included studies, verification and validation of the results of the thematic synthesis, interpretation of the thematic synthesis, and to commenting the article.

JVC contributed to the study design, selection process, quality assessment of the included studies, verification and validation of the results of the thematic synthesis, interpretation of the thematic synthesis, and to drafting the article.

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Appendix 1- Quality assessment of the included articles based on the Mixed Methods Appraisal Tool (version 2018)

Authors	Study Title	Category of study design	Methodological quality criteria	Yes	No	Can't Tell
Myllymäki, S, Laukka, E, Kanste, O.	**Health and social care frontline leaders' perceptions of competence management in telemedicine in Finland: An interview study**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?	**X**		
			1.2. Are the qualitative data collection methods adequate to address the research question?	**X**		
			1.3. Are the findings adequately derived from the data?	**X**		
			1.4. Is the interpretation of results sufficiently substantiated by data?	**X**		
			1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	**X**		
Statton, S et all	**Professional learning needs in using video calls identified through workshops**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?	**X**		
			1.2. Are the qualitative data collection methods adequate to address the research question?	**X**		

			1.3. Are the findings adequately derived from the data?	**X**		
			1.4. Is the interpretation of results sufficiently substantiated by data?	**X**		
			1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	**X**		
Jiménez-Rodríguez et all	**Nurse training in gender-based violence using simulated nursing video consultations during the COVID-19 pandemic: A qualitative study**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?	**X**		
			1.2. Are the qualitative data collection methods adequate to address the research question?	**X**		
			1.3. Are the findings adequately derived from the data?	**X**		
			1.4. Is the interpretation of results sufficiently substantiated by data?	**X**		
			1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	**X**		
MacNeill et all	**Experiences of front-line health professionals in the delivery of telehealth: A qualitative study**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?	**X**		

			1.2. Are the qualitative data collection methods adequate to address the research question?	**X**		
			1.3. Are the findings adequately derived from the data?	**X**		
			1.4. Is the interpretation of results sufficiently substantiated by data?	**X**		
			1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	**X**		
Segato, F., Masella, C	**Telemedicine services: How to make them last over time**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?	**X**		
			1.2. Are the qualitative data collection methods adequate to address the research question?	**X**		
			1.3. Are the findings adequately derived from the data?	**X**		
			1.4. Is the interpretation of results sufficiently substantiated by data?	**X**		
			1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	**X**		
Johnson et all	**Improvement of communication and interpersonal competence in**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		

	telenursing - development of a self-assessment tool	1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?	**X**		
			1.2. Are the qualitative data collection methods adequate to address the research question?	**X**		
			1.3. Are the findings adequately derived from the data?			**X**
			1.4. Is the interpretation of results sufficiently substantiated by data?			**X**
			1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?			**X**
Yliluoma, P., Palonen, M.	**Telenurses' experiences of interaction with patients and family members: nurse–caller interaction via telephone**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?	**X**		
			1.2. Are the qualitative data collection methods adequate to address the research question?	**X**		
			1.3. Are the findings adequately derived from the data?	**X**		
			1.4. Is the interpretation of results sufficiently substantiated by data?	**X**		
			1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	**X**		

Veikkolainen et all	**eHealth competence building for future doctors and nurses – Attitudes and capabilities**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		3.Quantitative nonrandomized	3.1. Are the participants representative of the target population?			**X**
			3.2. Are measurements appropriate regarding both the outcome and intervention (or exposure)?	**X**		
			3.3. Are there complete outcome data?	**X**		
			3.4. Are the confounders accounted for in the design and analysis?	**X**		
			3.5. During the study period, is the intervention administered (or exposure occurred) as intended?	**X**		
Susanti, et all	**Midwifery Continuity of Care in Indonesia: Initiation of Mobile Health Development Integrating Midwives' Competency and Service Needs**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		5. Mixed methods	5.1. Is there an adequate rationale for using a mixed methods design to address the research question?	**X**		
			5.2. Are the different components of the study effectively integrated to answer the research question?	**X**		
			5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	**X**		
			5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?			**X**
			5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?	**X**		
Pettinari, C.J., Jessopp, L.		Screening questions	S1. Are there clear research questions?	**X**		

	'Your ears become your eyes': Managing the absence of visibility in NHS direct		S2. Do the collected data allow to address the research questions?	**X**		
		1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?	**X**		
			1.2. Are the qualitative data collection methods adequate to address the research question?		**X**	
			1.3. Are the findings adequately derived from the data?	**X**		
			1.4. Is the interpretation of results sufficiently substantiated by data?	**X**		
			1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	**X**		
Kaminsky, E., Rosenqvist, U., Holmström, I.	**Telenurses' understanding of work: Detective or educator?**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?	**X**		
			1.2. Are the qualitative data collection methods adequate to address the research question?	**X**		
			1.3. Are the findings adequately derived from the data?	**X**		
			1.4. Is the interpretation of results sufficiently substantiated by data?	**X**		

			1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	**X**		
Hoare K, Lacoste J, Haro K, Conyers C.	**Exploring indicators of telephone nursing quality.**	Screening questions	S1. Are there clear research questions?		**x**	
			S2. Do the collected data allow to address the research questions?	**X**		
Moscato et all	**Predictors of patient satisfaction with telephone nursing services.**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		5. Mixed methods	5.1. Is there an adequate rationale for using a mixed methods design to address the research question?	**X**		
			5.2. Are the different components of the study effectively integrated to answer the research question?	**X**		
			5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	**X**		
			5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?	**X**		
			5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?	**X**		
Stacey D, O'Connor AM, Graham ID, Pomey MP.	**Randomized controlled trial of the effectiveness of an intervention to implement evidence-based patient decision support in a nursing call centre.**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		2. Quantitative randomized controlled trials	2.1. Is randomization appropriately performed?	**X**		
			2.2. Are the groups comparable at baseline?	**X**		
			2.3. Are there complete outcome data?	**X**		
			2.4. Are outcome assessors blinded to the intervention provided?			**X**

			2.5 Did the participants adhere to the assigned intervention?	**X**		
Rutledge et all	**Telehealth Competencies for Nursing Education and Practice: The Four P's of Telehealth.**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?	**X**		
			1.2. Are the qualitative data collection methods adequate to address the research question?	**X**		
			1.3. Are the findings adequately derived from the data?	**X**		
			1.4. Is the interpretation of results sufficiently substantiated by data?	**X**		
			1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	**X**		
Thye et all	**What Are Inter-Professional eHealth Competencies?**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		4. Quantitative descriptive	4.1. Is the sampling strategy relevant to address the research question?	**X**		
			4.2. Is the sample representative of the target population?			**X**
			4.3. Are the measurements appropriate?	**X**		
			4.4. Is the risk of nonresponse bias low?			**X**
			4.5. Is the statistical analysis appropriate to answer the research question?	**X**		

Souza et all	**Evaluation of nurse's performance in telemedicine.**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?	**X**		
			1.2. Are the qualitative data collection methods adequate to address the research question?	**X**		
			1.3. Are the findings adequately derived from the data?	**X**		
			1.4. Is the interpretation of results sufficiently substantiated by data?	**X**		
			1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	**X**		
Honey M, Wright J.	**Nurses developing confidence and competence in telehealth: results of a descriptive qualitative study.**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?	**X**		
			1.2. Are the qualitative data collection methods adequate to address the research question?	**X**		
			1.3. Are the findings adequately derived from the data?	**X**		
			1.4. Is the interpretation of results sufficiently substantiated by data?	**X**		

			1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	**X**		
van Houwelingen et all	**Competencies required for nursing telehealth activities: A Delphi-study.**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?	**X**		
			1.2. Are the qualitative data collection methods adequate to address the research question?	**X**		
			1.3. Are the findings adequately derived from the data?	**X**		
			1.4. Is the interpretation of results sufficiently substantiated by data?	**X**		
			1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	**X**		
van Houwelingen et all	**Hospital Nurses' Self-Reported Confidence in Their Telehealth Competencies.**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		5. Mixed methods	5.1. Is there an adequate rationale for using a mixed methods design to address the research question?	**X**		
			5.2. Are the different components of the study effectively integrated to answer the research question?	**X**		
			5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	**X**		

			5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?			**X**
			5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?	**X**		
Holmström I, Höglund AT.	**The faceless encounter: ethical dilemmas in telephone nursing.**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?	**X**		
			1.2. Are the qualitative data collection methods adequate to address the research question?	**X**		
			1.3. Are the findings adequately derived from the data?	**X**		
			1.4. Is the interpretation of results sufficiently substantiated by data?	**X**		
			1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	**X**		
Whitson HE, Hastings SN, McConnell ES, Lekan-Rutledge DA.	**Inter-disciplinary focus groups on telephone medicine: a quality improvement initiative.**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?	**X**		
			1.2. Are the qualitative data collection methods adequate to address the research question?	**X**		

			1.3. Are the findings adequately derived from the data?	**X**		
			1.4. Is the interpretation of results sufficiently substantiated by data?	**X**		
			1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	**X**		
Mattisson M, Börjeson S, Årestedt K, Lindberg M.	**Interaction between telenurses and callers - A deductive analysis of content and timing in telephone nursing calls.**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		5. Mixed methods	5.1. Is there an adequate rationale for using a mixed methods design to address the research question?	**X**		
			5.2. Are the different components of the study effectively integrated to answer the research question?	**X**		
			5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	**X**		
			5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?			**X**
			5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?	**X**		
Grady JL, Schlachta-Fairchild L.	**Report of the 2004-2005 International Telenursing Survey.**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		5. Mixed methods	5.1. Is there an adequate rationale for using a mixed methods design to address the research question?	**X**		
			5.2. Are the different components of the study effectively integrated to answer the research question?	**X**		

			5.3. Are the outputs of the integration of qualitative and quantitative components adequately interpreted?	**X**		
			5.4. Are divergences and inconsistencies between quantitative and qualitative results adequately addressed?			**X**
			5.5. Do the different components of the study adhere to the quality criteria of each tradition of the methods involved?	**X**		
Payette C, Desrochers J, Lavoie-Tremblay M, Richer MC.	**Exploring perceptions of healthcare professionals in the implementation of a new professional role of clinical telehealth coordinator within a university integrated healthcare network.**	Screening questions	S1. Are there clear research questions?	**X**		
			S2. Do the collected data allow to address the research questions?	**X**		
		1. Qualitative	1.1. Is the qualitative approach appropriate to answer the research question?	**X**		
			1.2. Are the qualitative data collection methods adequate to address the research question?	**X**		
			1.3. Are the findings adequately derived from the data?	**X**		
			1.4. Is the interpretation of results sufficiently substantiated by data?	**X**		
			1.5. Is there coherence between qualitative data sources, collection, analysis and interpretation?	**X**		

Multimedia Appendix 2- Data extraction table: Characterization of the included studies.

Authors, date and country of publication	Study design	Period of data collection	Sample and setting	Objetives	Description of the intervention	Main results
Myllymäki, S., Laukka, E., & Kanste, O. (2022). Health and social care frontline leaders' perceptions of competence management in telemedicine in Finland: An interview	Descriptive qualitative study.	Spring of 2021	The study was conducted using thematic interviews of 10 frontline leaders from primary health care, specialized medical care and social care in the context of telemedicine. Of the interviewed leaders, five had backgrounds in health care (nursing or physiotherapy)	To describe competence management in telemedicine from the perspective of health and social care frontline leaders	The thematic interview guide concerned organization culture, resources, data management processes, management and leadership, strategy and patient-centeredness and these themes were attached to the specific context of telemedicine.	(1) Characteristics and Attitudes of Frontline Leader: Accessibility; Credibility; Feedback Tolerance; Positive Attitude; Resistance; Influencing (2) Professional Competence management: Assesses team competence; Arranging training; Enabling learning (3) Implements Strategy (4) Ensures and Promotes Quality (5) Promotes cooperation

study. *Journal of Nursing Management*, *30*(7), 2724-2732.			and five in social care			
Statton et all, 2016 UK	Descriptive qualitative study.	Five face-to-face workshops were held between May and July 2015. In September 2015, an online workshop was	116 participants included nurses, allied HCPs, doctors and volunteers In a subsequent online workshop, 21 participants ranked seven groups of learning needs in priority order	Identify learning needs of healthcare professionals (HCPs) in using video calls to support patients (and their carers) to die at home	Face-to-face workshops with 8–12 participants per group discussed on whether video calls could be used to support patients in the last six months of their lives to die at home. Each workshop had two sessions. First, participants discussed advantages, disadvantages, learning needs and	(1) Confidence and technical ability in using video Call (2) Being aware of how video calls fit into clinical Practice (3) They should know how to get the best lighting, image and sound (4) Presenting video calls as an option to patients and families to assess their readiness (5) Communication skills on 'camera': HCPs need to know how to use non-verbal communication during a

		conducted inviting participants from the UK			research and development needs of using video calls. Secondly, participants discussed scenarios, learning needs and research and development needs of using video calls. Online workshop: Participants were asked to rate whether or not a 'typical' HCP dealing with end-of-life had these skills already or would need training to develop them	video call. (6) Understanding how patients and families may be affected by video call use (7) increase multidisciplinary teamwork aiding support and communication between team members and the family and patient. (8) Education was seen by all participants as important in overcoming barriers to using video calls.
Jiménez-Rodríguez, D., Belmonte	Descriptive qualitative study	26 March and 2 April 2020	48 students in the third-year undergraduate enrolled in the	To explore the perceptions and opinions of third-year nursing	Students participated in the mandatory high-fidelity simulation sessions. Data collection	Categories and subcategorys emerged from the four open-ended questions: (1) Active-Listening

García, M. T., Santillán García, A., Plaza Del Pino, F. J., Ponce-Valencia, A., & Arrogante, O. (2020). Nurse training in gender-based violence using simulated nursing video consultations during the COVID-19			four-year nursing degree at a public university in Spain (University of Almeria)	students about the use of simulated video consultations to assist potential cases of gender based violence victims	was carried out through semi-structured interviews following a guide composed of four open-ended questions. This phase encouraged students to reflect on their aspects to be improved, creating awareness about what they needed to learn and do in order to improve their future clinical practice. All of the perceptions and opinions from the students' interviews were transcribed and reviewed by two researchers. A content analysis of the qualitative data was performed.	(2) Generate trust (3) Addressing Non-Technical Skills: Listening, empathy, trust. (4) Recognizing and managing the patient's emotions (5) Improve interview technique

pandemic: A qualitative study. *International journal of environmental research and public health*, *17*(22), 8654.						
MacNeill, V., Sanders, C., Fitzpatrick, R., Hendy, J., Barlow, J., Knapp, M., & Newman, S. P. (2014). Experience	Qualitative study	Between 2008 and 2010.	Semi-structured qualitative interviews with 32 front-line health professionals (13 community matrons, 10 telehealth monitoring nurses and 9 GPs) involved in the	To examine the views and experiences of healthcare professionals caring for patients receiving the telehealth intervention.	A semi-structured interview guide was developed following a review of literature and discussions between the authors. The main interview topic areas covered implementation of telehealth at local level, impact on practice, on professional–patient	(1) The vast majority of nursing participants viewed telehealth as a revolutionary and potentially beneficial change in the delivery of health care, as long as it was presented to patients as an optional rather than essential part of their healthcare plan, supplementing rather than replacing traditional health care.

s of front-line health professionals in the delivery of telehealth: a qualitative study. *British Journal of General Practice*, *64*(624), e401-e407.			delivery of telehealth. All interviews lasted 30-60 minutes.		relationships and on interprofessional communication and relationships.	(2) Nurses also viewed it as a chance to increase their clinical knowledge and skills and gain greater freedom to make decisions about patient care (3) Telehealth can empower the patient understanding their condition, leading to behavioral changes and often to improvements in, or stabilizing of, their condition and quality of life
Segato et all, 2017 Italy	Exploratory in-depth longitudinal study	2010-2015	Firstly were conducted a literature review. Then screened the telemedicine services implemented in	Investigate how the factors supporting the implementation of telemedicine services affect their duration over time and	Semi-structured interviews aimed to gather knowledge about the specific service offered to the patients and to engage key informants in the discussion about five	(1) Nurses are keen to use technological devices more than in the past and their confidence, together with the participation onto structured training programs, boosts the patients and caregivers' confidence in technologies.

			Italy between 2008 and 2010	explore if further factors need to be considered, to foster the services duration.	factors included in the theoretical framework (i.e. technology, acceptance, organization, financing, and policy and legislation	(2) Professionals (especially nurses) argued that being part of the telemedicine service was source of great satisfaction and this works as a durable motivating factor. (3) the role of the nurses in educating and supporting the patients as well as their caregivers in the use of devices is crucial, together with timely responses by the providers in case of technology breakdown. (4) By being responsible for the training of patients to the use of devices and for their monitoring over time, nurses acquire new competences and expand their role. (5) The organizational stability was assured through the enhancement of the role of the nurses.

Johnson, C., Wilhelmsson, S., Börjeson, S., & Lindberg, M. (2015). Improvement of communication and interpersonal competence in telenursing – development of a self-assessment tool. *Journal*	Qualitative	Development stage: from 2008 to 2009 Assessment stage: from 2009 to 2013	Development stage: 29 relevant papers were found Assessment stage with a panel of 10 experts Assessment stage: 10 telenurses	To develop a self-assessment tool aiming to raise telenurses' awareness of their communication and interpersonal competence and highlight areas in need of improvement.	The process to determine content validity was done in 2 stages; the development stage and the assessment stage. The development stage started with a literature search. The assessment stage was separated into 2 phases, assessment by an expert group and assessment and test by telenurses. The telenurses also participated in consensus discussions.	(1) Created a telenursing self-assessment tool with 58 items. The items were sorted into 5 sections according to the nursing process.

of clinical nursing, *24*(11-12), 1489-1501. http://dx.doi.org/10.1111/jocn.12705						
Yliluoma et al 2020 Finland	Qualitative descriptive	2017	N= 9 nurses	To describe how telenurses experience caller interactions	A qualitative study designed through open telephone interviews with call centre nurses. The first author consulted an interview guide with a list of open-ended questions, each based on literature and professional expertise. The data were analyzed using inductive content analysis.	(1) Nurses' communication skills, including their ability to listen and use intuition and sensitivity to understand the caller's situation without the benefit of eye contact, improved telephone interactions. (2) Nurses with more work experience described the advantages of earlier clinical experiences in visualizing the callers' symptoms. (3) Friendliness, empathy, politeness and openness were listed as important qualities to display.

						(4) Giving each caller enough time to explain the situation at the beginning of the call, being genuinely present, using humor when appropriate and greeting the caller according to the time of day were nurses' methods of promoting positive interactions. (5) Remaining calm in every situation was an important part of successfully finishing each call. (6) Adjusting voice rhythm and tone to match the situation (7) Nurse-led control over the call was needed to keep interactions rational. (8) Disturbing background sounds, communication problems and service system shortcomings challenged the telephone interactions

						(9) Communicating through family members was sometimes challenging and confusing if family member and person in need provided different information (10) Confidentiality requirements made communicating via family members challenging because the nurses were unable to provide certain details to the family member
Veikkolainen, P., Tuovinen, T., Jarva, E., Tuomikoski, A. M., Männistö, M., Pääkkönen, J., ... & Reponen, J. (2023).	Quantitative non-randomized cross-sectional study	From 29 April to 4 May of 2021.	107 participants, of which 106 were medical students and 64 were nursing students (34 public health nursing, 12 midwives and 8 paramedics degree programmes).	To describe the attitudes of medical and nursing students towards digital health based on self-evaluation as well as to compare the differences in perceptions	The questionnaire consisted of seven demographic questions and 16 statements with a five-point Likert scale, surveying student attitudes on digital health and their digital competencies. The questions were divided into five themes: the usage of patient-	(1) Interested in advancing practices in my workplace by experimenting with new solutions (2) Basic education of health care professionals should teach a type of mindset that leads to innovation and improvement of practices. (3) Patient viewed as an active governor of their own health information (4) The engagement of the patient in their treatment and care (for

eHealth competence building for future doctors and nurses–Attitudes and capabilities. *International Journal of Medical Informatics*, *169*, 10491.				between the two student groups	generated information and the role of applications in patient care; health information systems; the digitalization of the working environment; the changing role of patients and professionals; and the culture of experimentation and readiness to participate in innovation activities.	example, by using electronic self-monitoring and self-care systems) leads to a better patient motivation and improved health outcomes
Susanti, Ali, Hernawan, & Stellata (2022). Midwifery Continuity of Care in Indonesia:	Mixed methods (cross-sectional and Focus Group)	August to December 2021.	373 midwives participated in a questionnaire and 13 midwives participated in the focus group discussion	To identify and explore midwives' competency and service needs to develop mHealth in Midwifery	This study was divided in two moments: 1. Quantitative research data were collected using a Google form questionnaire	(1) Midwife skills must be continuously improved with training and educational material (2) Mobile health should have a education menu for midwifes; monitor postpartum maternal

Initiation of Mobile Health Development Integrating Midwives' Competency and Service Needs. *International journal of environmental research and public health*, *19*(21), 13893.				Continuity of Care (MCOC) education and training	(online) consisted of competencies in midwifery care. 2. Qualitative research assessed the importance of competence to provide MCOC using an android smartphone, especially for communication, information, and education to patients.	health; comunicate with other healthcare professions
Pettinari, C. J., & Jessopp, L.	Qualitative analysis of semi-	Interviews were	In the first series of interviews, 14 nurses, including	To identify and describe nurses' perceptions of	Nurses participated in 2 semi-structured interviews about their	Nurses in a national telephone advice line developed skills to manage interaction with callers

(2001). 'Your ears become your eyes': managing the absence of visibility in NHS Direct. *Journal of advanced nursing*, *36*(5), 668-675.	structured interviews	conducted twice: at the end of the 12-week training session and after having worked for 6 months.	two supervisors were interviewed. In the second series, 12 nurses.	interactional practices they use to manage the absence of visual cues in telephone consultations with callers at an NHS Direct site	expectations of work practices, and their attitudes and concerns about key features of NHS Direct telephone consultations.	in order to compensate for the lack of visual cues such as: (1) Caller self-tests; (2) Associate-assisted testing (3) Modelling body location (4) Selective listening (5) Listening for physical signs (6) Listening for background sounds (7) Personalizing call (8) Displaying sensitivity to caller environment (9) Explaining rationale
Kaminsky et all, 2008 Swedemn	Qualitative	Conducted during 2004–2005	12 of the 20 telenurses working at a call centre in Sweden were interviewed, five of them twice because of	To describe the different ways of understanding work among a group of Swedish telenurses	Phenomenographic interviews, with open-ended questions, were conducted in a spare room at the telenurse's workplace. The interviews lasted from 45 to 90 minutes, and were	(1) Assess, refer and give advice to the caller: search for clues such as expressions of anxiety or sounds, e.g. coughing or breathing, and tried to stay calm themselves, giving the caller enough time to talk. (2) Support the caller: maintain

			organizational changes		tape-recorded and transcribed verbatim. The main questions were (1) When do you feel you have succeeded in your telenursing work? (2) What is central or the core of your telenursing work? (3) What do you find difficult in your telenursing work?	contact with a caller during a work shift by calling back, checking to determine whether the caller was recovering after advice was given (3) Strengthen the caller: nurses gave the caller credit for self-care actions already performed.
Moscato, S., Valanis, B., Gullion, C., Tanner, C., Shapiro, S., & Izumi, S. (2007). Predictors of patient satisfaction with	Mixed methods	2007	12 nurses were selected to sample based on their work experience and working hours. Each of the selected and consenting nurses tape-recorded up to	To explore the relationships between outcomes of telephone nursing advice and characteristics of callers, nurses, and systems in	Nurses obtained patient consent after reading a consent statement at the beginning of the cal. It was mailed a Caller Questionnaire (CQ) to each eligible caller to obtain their perception of the quality and outcomes of the advice call. It was measured the patient	(1) Confidence is built in the caller when there is trust that the nurse is knowledgeable, skilled in understanding and assessing caller concerns (2) Ability to collaborate (3) Careful listening, collaboration, and clarity reflect caring behaviors of the nurse (4) Establish rapport with the caller

telephone nursing services. *Clinical Nursing Research*, *16*(2), 119-137.			150 of their phone conversations with advice callers during a 2-week period.	which the advice service operates.	satisfaction, expectations using a fourpoint scale from 1 (*not very important or not applicable*) to 4 (*extremely important*)	
Stacey et all, 2006 Canada	Quantitative randomized controlled trial	2006	Forty-one registered nurses at a health call center were randomly assigned to an intervention or control group	To evaluate the effect of an intervention on call centre nurses' knowledge of decision support and skills in coaching callers	41 nurses received a simulated patient call, afterwards they were randomly assigned to an intervention or control group. The intervention involved a structured coaching protocol, a 3-h online tutorial and a 3-h skill-building workshop that included performance feedback from baseline calls with simulated patients. 1	(1) The intervention improved nurses' knowledge and coaching skills, without adversely affecting the length of the calls. (2) The intervention group nurses were more likely to have assessed the callers decisional needs (i.e. knowledge, values clarity, support) and tailored their coaching appropriately

					month later both intervention and control group received a call from a simulated patient.	
Rutledge et all 2021 USA	Qualitative Delphi technique	During 2019/2020	12 advanced practice registered Nurse led by 3 project facilitators with expertise in telehealth, education, and competency development	To describe the development of telehealth competencies for education and practice	The taskforce followed a 3-phase modified Delphi technique to identify, develop, and evaluate/apply the telehealth competencies	(1) Developing skills related to technology may require the learner to have actual hands-on experience. (2) consent, confidentiality, security, protected health information, (3) telehealth etiquette; (4) clinical assessments (5) technology skills.
Thye, J., Shaw, T., Hüsers, J., Esdar, M., Ball, M., Babitsch, B., & Hübner, U.	Quantitative descriptive	February until June 2017.	892 participants responded to at least one section of the questionnaire, out of which 718 experts provided answers for the	To investigate which competencies are at the intersection of the individual groups of health professionals	In a first step, we looked at which eHealth competencies were represented in the top ten among all professional roles (leadership and communication). In a second step, the	(1) Leadership (2) Communication (3) Ethics in health (4) Documentation (5) Quality and Safety management (6)Management in patient care

(2018). What are inter-professional ehealth competencies?. In *German Medical Data Sciences: A Learning Healthcare System* (pp. 201-205).			section on eHealth competencies.		professional roles were clustered into the four groups: direct patient care (physicians, nurses, pharmacists, other health care professions), executives (technical and clinical CEOs / CIOs), IT (engineering / IT specialist) and science & education	
Souza, C., Oliveira, D., Santana, A., Mulatinho, L., Cardoso, M., Pereira, E., &	Qualitative, descriptive and exploratory study	Performed between July and December 2016.	The sample consisted of 19 nurses, mostly female with mean age of 30 years old at Emergency Care Units.	To describe the role of nurses in the telemedicine program in cardiology implemented in	It was used for collecting data an instrument formatted on the Google platformed, which was compose of questions to describe the sociodemographic profile	(1) Nurses receive the patient in the emergency care unit (2) Refer the patient for tele- ECG and perform the exam after anamnesis and physical exam

Aquino, J. (2019). Evaluation of nurse's performance in telemedicine. *Revista brasileira de enfermagem*, *72*(4), 933-939.				Pernambuco, Brazil	of subjects and also contained discursive questions about the nurse's knowledge, purpose and performance in the Telemedicine Program in Cardiology.	(3) Send the results to telemedicine who elaborates the report, through a online communication.
Michelle Honey & Jane Wright (2018): Nurses developing confidence and competence in	Descriptive qualitative	Two months in 2013.	Nine nurses were recruited through snowball sampling.	To explore what nurses considered important to confidently and competently participate in telehealth.	Involved a single semi-structured interview lasting 40 to 60 min either face-to-face, by telephone or videoconference. Interviews were audio recorded and later transcribed by one author.	(1) The ability to receive practical hands-on training on the use of the equipment before having to use it in a clinical situation. (2) Participants felt a nurse needed to have a good knowledge base and experience in their specialty. (3) Having the skills and feeling comfortable with the technology increased the participant's levels of

telehealth: results of a descriptive qualitative study, *Contemporary Nurse*, DOI: 10.1080/10376178.2018.1530945					Each participant was also asked to rate their level of competence with telehealth using Benner's (2000) terms of novice, advanced beginner, competent, proficient and expert and to rate their level of confidence using telehealth as: Not confident, moderately confident or very confident. It was performed a thematic analysis	confidence. (4) Mentorship by those experienced in telehealth was a strong recommendation.
Van Houwelingen, C., Moerman, A., Ettema, R. Kort, H., & Ten Cate,	Qualitative: Delphi-study	Between October and December 2013.	Delphi- round 1: 51 experts (Nurses; nursing faculty; technicians, clients)	Study aims to discuss nursing telehealth practice in depth, by exploring the knowledge,	In a four-round Delphi-study, a panel of experts discussed which nursing telehealth entrustable professional activities are relevant for nurses and	(1) Training patients in the use of technology (2) Analyzing and interpreting incoming data derived from (automatic) devices for self-measurements

O. (2016). Competencies required for nursing telehealth activities: A Delphi-study. *Nurse education today*, *39*, 50-62.			Delphi round 2: 32 experts (Nurses; Nursing faculty, technicians, clients) Delphi round 3: 25 experts (Nurses; Nursing faculty, technicians, clients) Delphi round 4: 3 authors, 2 nurses, 1 nursing lecturer	skills and attitudes that nurses need for the execution of professional telehealth activities in an attempt to facilitate the development of telehealth education and the acceptance of telehealth	which competencies nurses need to possess to execute these activities effectively	(3) Assessing patient capacity to use telehealth (4) Evaluating and adjusting the patient care plan (5) Coordination of care with the use of telehealth technology (6) knowledge of policies, procedures, and protocols of the organization concerning the deployment of telehealth technologies (7) Knowledge of the laws and regulations concerning the protection and exchange of medical data (8) Knowledge of how to collect health-related data for patient monitoring (9) Instructing patients and family care givers in self-care

						(10) Basic ICT (information and communication technology) skills, such as the use of the computer (11) Able to check equipment for functionality
Van Houwelingen, C., Ettema, R. G., Kort, H., & Ten Cate, O. (2019). Hospital nurses' self-reported confidence in their telehealth competencies. *The Journal of*	Cross-sectional study	Between October and March 2017.	1017 nurses registered in the three hospital were asked to complete an online questionnaire with seven sociodemographic questions and 31 questions that asked to rate their confidence in possessing KSAs (Knowledge,	To describe how hospital nurses' self-rate their confidence in essential telehealth KSAs, summarized as telehealth care competence. This insight is needed for the development of nursing telehealth continuing		(1) Nurses had the most confidence in possessing basic IT skills, such as use of the Internet and a personal computer and they had the least confidence in having knowledge of “the procedure: what to do in case of an emergency during the use of telehealth” (2) Nurses suggested additional topics to be included in telehealth education such as analyzing and interpreting incoming data derived from (automatic) devices for self-measurement ; Use of (new) devices: use, safety, practical aspects and providing

Continuing Education in Nursing, *50*(1), 26-34.			Skills and Attitude).	education programs.		health care remotely: for example, medication check, video communication and knowledge concerning laws and regulations.
Holmström, & Höglund, (2007). The faceless encounter: ethical dilemmas in telephone nursing. *Journal of Clinical Nursing*, *16*(10), 1865-1871.	Qualitative	During April 2004 and December 2005x	N= 12 telenurses	To describe ethical dilemmas, in the form of conflicting values, norms and interests, which telenurses experience in their work	The interviews focused on the professionals' personal experiences of the patient encounter by telephone. The informants were asked about their difficulties at work and their experiences of ethical dilemmas. The interviews lasted 45– 90 minutes and were audio-recorded. A second interview round was carried out with the same telenurses one year after the first	(1) Talking through a third party (2) Discussing personal and sensitive problems over the phone (3) Insufficient resources and the organization of health care (4) Balancing callers' information needs with professional Responsibility (5) Differences in judging the caller's credibility

					interview to expand and refine findings.	
Whitson, H., Hastings, S., McConnell & Lekan-Rutledge (2006). Inter-disciplinary focus groups on telephone medicine: a quality improveme nt initiative. *Journal of the American Medical*	Qualitative	June 2004	8 nurses and 4 geriatric medicine fellows participated in two 45-minute focus groups	To identify opportunities for quality improvement in long-term care telephone medicine us-ing a model of interdisciplinary focus groups.	The focus groups were structured around 3 intentionally open-ended questions posed to the groups at the beginning of each session: 1. What are the characteristics of a successful versus an unsuccessful telephone encounter between a nurse and a physician? 2. What are the characteristics of nurses or physicians who are easy versus difficult to work with when you practice telephone medicine?	Nurses: (1) Make a Pertinent patient assessment before calling a physicians (2) Avoids a demanding tone (3) Minimize interruptions (clusters calls, only calls if physician involvement is required) (4) Wiliness to retrieve additional patient information

Directors Association, *7*(7), 407-411.					3. What are the potential barriers to improving telephone medicine in the ECRC? All authors participated in a qualitative analysis of the information recorded at the focus groups and in an e-mail from one nurse. The 3 authors present at the focus groups reviewed the record of comments to ensure agreement on content.	
Mattisson et al, 2024 Sweden	Qualitative descriptive and a deductive analysis	Conducted in 2022	13 telenurses accepted participation	To explore the content and timing of verbal interaction between telephone nurses and	Transcribed telephone conversations (n = 30) to a national nurse-led advisory service were analyzed using deductive content analysis.	(1) Professional/ technical competencies: Telenurse expressions that demonstrate knowledge of the health care system/ organization; Telenurse expressions that reveal a systematic agenda for the

				callers, and to suggest areas for improvement	Categorization of data was based on components of interaction in the Interaction Model of Client Heath Behavior. The content was described both quantitatively, based on word count, and qualitatively, using descriptions and exemplars. Transcripts were also coded according to five phases in the conversation process: opening, listening, analyzing, motivating, and ending.	conversation and the conversation process; Information on the use of decision support system; Instructions for optimizing audio quality
Grady 2007 USA	Mixed methods	2004–2005	1700 persons accessed the survey online. The	To identify characteristics of telenurses,	The survey targeted those telenurses who were	(1) The highest number of respondents placed the integration of information technology and

	with quantitative and qualitative analyses		survey was completed by 719 nurses from 36 countries responded a survey via the Internet.	telenurses' satisfaction with their current telenursing role, specific knowledge and skills used by telenurses in their jobs and how these competencies were obtained, opinions on implementing education in telehealth, and perceptions about the effectiveness of telehealth in making an impact on the	actively practicing in telenursing at the time of the survey or working for an organization that supported telehealth/telemedicine. Two screening questions were asked to verify that participants were active in telenursing. Frequency and percentage distributions were obtained and analyzed for quantitative data. Spradley's ethnographic method11 was adapted for use in analyzing qualitative data	telehealth tools in a community or public health course; (2) telehealth technology tools should be included in the basic nursing curriculum (3) preparation for telenursing should include both clinical experiences and didactic learning regarding technology and telehealth principles (4) clinical experiences relate to the use of information technology and that telehealth tools should be incorporated into the nursing curriculum (5) Work satisfiers include autonomy, interaction, and professional status. Work satisfiers for this group include autonomy, interaction, and professional status.

				nursing shortage and the demand for telenurses worldwide		(6) The creation of formal education opportunities could lead to the development of protocols resulting in a standardized approach to the deliver of telehealthcare.
Payette, C., Desrochers, J., Lavoie-Tremblay, M., & Richer, M. C. (2010). Exploring perceptions of healthcare professionals in the implementation of a new professional	Descriptive qualitative design	During the fall of 2008.	To gather information from the three groups of HCPs involved in the targeted teleoncology program and ensure proportional representation of physicians (33,3%), nurses (44,4%), and pharmacists (22,3%).	To explore how healthcare professionals (HCPs) involved in a specialized teleoncology program perceive a new clinical telehealth coordinator (CTC) role within a university integrated healthcare network (UIHN)	The focus group and semistructured individual interviews were conducted using a semistructured interview guide, where three main categories were identified: perceptions of the role, core competencies, and key factors in the role implementation.	(1) The core competencies identified by the healthcare professionals included knowledge, expertise, and experience (2) Participants identified three key factors in the implementation of this role, namely, the structural support, having a common language, and making the implementation of this role relevant

role of clinical telehealth coordinator within a university integrated healthcare network. *Telemedicine and e-Health*, *16*(5), 614-619.				in a metropolitan area in Québec, Canada		

Conclusões e Perspetivas Futuras

Através da realização de uma revisão sistemática da literatura foi possível identificar o conjunto de competências que tanto os enfermeiros que estão na prestação direta de cuidados como os enfermeiros gestores devem possuir ou adquirir para prestar com segurança, eficácia, eficiência e qualidade os cuidados aos pacientes e às populações.

Os estudos incluídos na revisão sistemática remontam ao ano de 2001, sendo possível perceber que a temática das competências profissionais para telemonitorização tem pelo menos duas décadas, sendo que na última década os estudos publicados têm vindo a ganhar maior destaque e relevância. A origem geográfica dos estudos também é relevante. Foi possível identificar estudos provenientes dos cinco continentes, pelo que conseguimos concluir que a telemonitorização e a aquisição de competências por enfermeiros é uma problemática mundial, ajustada, porém, às especificidades e limitações da profissão de enfermagem de cada país.

Os resultados da revisão sistemática da literatura permitem concluir que a telemonitorização é uma ferramenta transformadora do modelo de prestação de cuidados de saúde sendo necessário o desenvolvimento de novas competências, particularmente dos enfermeiros. Enfermeiros prestadores de cuidados e enfermeiros gestores, necessitam de adquirir novas competências específicas para desenvolverem a sua prática no âmbito da telemonitorização. Competências comunicacionais e tecnológicas são comuns a ambas as categorias. A sua prevalência nos estudos analisados, e o conjunto de atividades que requerem para o seu desenvolvimento, retratam-nas como primordiais para a excelência da telemonitorização. Para enfermeiros gestores, competências de liderança geral, comunicacionais, organizacionais e gestão, e tecnológicas foram identificadas unicamente por dois artigos, salientando-se a necessidade de desenvolver estudos que investiguem em detalhe as competências especificas para estes profissionais no âmbito da telemonitorização.

A sistematização de competências e respetivos exemplos de operacionalização resultantes do estudo poderão constituir um instrumento de gestão para auto e heteroavaliação das competências dos enfermeiros em telemonitorização.

Transversalmente, considerando a discussão da revisão sistemática da literatura, é possível inferir que a integração da telemonitorização com a prática de enfermagem permite uma utilização mais eficiente dos recursos de saúde, otimizando o atendimento, reduzindo hospitalizações desnecessárias e melhorando a gestão do tempo. Não

obstante, enfermeiros com competências específicas em telemonitorização implementam precocemente intervenções capazes de prevenir complicações de saúde, reduzem a necessidade de cuidados mais complexos, diminuindo os custos gerais de saúde, beneficiando tanto os sistemas de saúde como os utentes.

Adicionalmente, é possível identificar-se a necessidade de criação de programas de formação, providenciando aos enfermeiros as competências essenciais para desenvolverem a sua prática clínica no âmbito da telemonitorização. Neste sentido, perspetiva-se investir na formação dos profissionais e gestores na área da saúde, inclusivamente durante a sua formação académica, para a utilização de serviços de telemedicina e/ou saúde digital. Além do investimento teórico, a formação deverá incluir componente prática com cenários de telemonitorização, permitindo aos enfermeiros praticar a utilização de dispositivos e plataformas digitais aprendendo a interpretar os dados obtidos e a tomarem decisões clínicas baseadas nessas informações.

Com a rápida evolução tecnológica, é fundamental que os enfermeiros, regularmente, tenham acesso a programas de formação contínua garantindo que estejam atualizados acerca das últimas inovações em telemonitorização e possam adaptá-las à sua prática. O incentivo à participação de enfermeiros em estudos e projetos de investigação na área da telemonitorização é vital, contribuindo para o avanço do conhecimento científico na área, e para que os mesmos estejam na vanguarda das melhores práticas.

No âmbito das políticas de saúde, o investimento na formação dos enfermeiros em telemonitorização constitui uma necessidade estratégica para garantir a sustentabilidade do sistema de saúde e a melhoria contínua na prestação de cuidados. Com enfermeiros devidamente competentes, será possível proporcionar cuidados de saúde personalizados, eficientes e acessíveis, permitindo uma intervenção precoce reduzindo a necessidade de internamentos hospitalares, melhorando por sua vez os resultados em saúde.

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Anexos

Anexo 1- Submissão do artigo

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Essential Competencies for Nurses in Telemonitoring Programs and Their Contribution to Healthcare Service Management: Systematic Review

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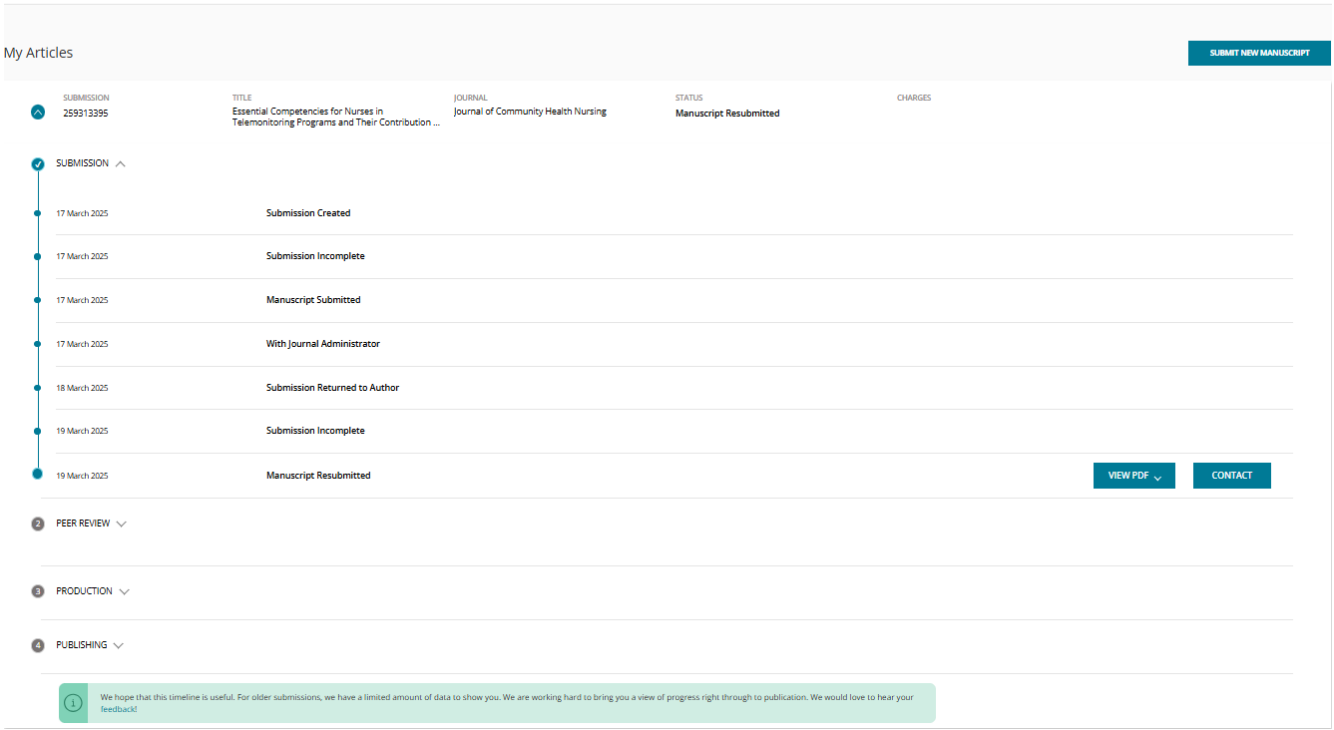
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