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Triage Competence and Challenges Among Registered Nurses in Emergency Care

A descriptive literature review

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Abstract

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The purpose of this bachelor's thesis was to describe the competence and challenges encountered by registered nurses in performing triage assessments within emergency care settings. By conducting a descriptive literature review, the study aimed to produce new knowledge about nursing triage assessment that can be utilized to improve the level of in-service training for emergency nurses.

The methods involved the examination of academic databases CINAHL and Medline, yielding a total of 305 records. After applying inclusion and exclusion criteria, 10 studies were selected for analysis. The data were analysed using inductive content analysis, resulting in the identification of two main categories: nurses' competence in triage and the challenges faced.

The results reported that nurses' triage competence is significantly influenced by clinical reasoning, structured training, education and professional experience. However, challenges such as heavy workloads, resource limitations, and communication barriers were frequently identified. Additionally, the findings highlighted inconsistencies in the application of triage protocols and the need for ongoing education to reduce knowledge gaps.

This study concludes that nurses' triage competence can be improved by a combination of structured training programs, updated protocols, adaptive technology, and organizational support. Addressing systemic challenges, such as staffing shortages and resource limitations, is essential to improving triage accuracy and reducing the risk of burnout. These findings may contribute to the development of more effective triage systems and professional development programs for nurses in emergency care settings

Keywords: nurse, triage, competence, challenges, and emergency care settings

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Tämän opinnäytetyön tavoite oli kuvata sairaanhoitajan osaamista ja haasteita, joita hän kohtaa suorittaessaan triage-arviointeja ensihoitoympäristössä. Tutkimuksen tavoitteena oli kuvailevan kirjallisuuskatsauksen avulla tuottaa uutta tietoa hoitotyön triage-arvioinnista, jota voidaan hyödyntää päivystyshoitajien jatkokoulutuksen tason parantamisessa.

Menetelmiin kuului tieteellisten tietokantojen CINAHL ja Medline tarkistaminen, jonka tuloksena saatiin yhteensä 305 merkintää. Sisällytys- ja poissulkukriteerien soveltamisen jälkeen analysoitavaksi valittiin 10 tutkimusta. Aineisto analysoitiin induktiivisen sisällönanalyysin avulla, jonka tuloksena tunnistettiin kaksi pääluokkaa: sairaanhoitajien triage-osaaminen ja kohdatut haasteet.

Tulosten mukaan sairaanhoitajien triage-osaamiseen vaikuttavat merkittävästi kliininen päättely, suunnitelmallinen koulutus, ammatillinen koulutus ja työkokemus. Usein todettiin, että haasteita ovat esimerkiksi raskas kuormitus, resurssien rajallisuus ja kommunikaatioesteet. Lisäksi tulokset korostivat epäjohdonmukaisuutta triage-protokollien soveltamisessa ja jatkuvan koulutuksen tarvetta osaamispuutteiden vähentämiseksi.

Tässä opinnäytetyössä todetaan, että sairaanhoitajien triage-pätevyys voidaan parantaa yhdistämällä jäsenneltyjä koulutusohjelmia, päivitettyjä protokollia, sopeutuvaa teknologiaa ja organisaation tukea. Järjestelmään liittyviin haasteisiin, kuten henkilöstöpulaan ja resurssien rajallisuuteen, puuttuminen on tärkeää, jotta voidaan parantaa triage-tarkkuutta ja vähentää burnoutriskiä. Nämä havainnot voivat auttaa kehittämään tehokkaampia triage-järjestelmiä ja ammatillisia kehittämisohjelmia sairaanhoitajille ensihoitoympäristöissä.

Avainsanat: sairaanhoitaja, triage, osaaminen, haasteet ja ensihoitoympäristöt.

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1 Introduction

Emergency triage assessment is a paramount component of emergency care. The function is to rank the patient based on the severity of their medical emergencies. The practice allows for treating those whose urgency necessitates immediate treatment while maintaining patient flow in the emergency department (ED) (Hinson et.al 2019: 140; Zachariasse et.al 2019: 1.) Triage tools such as the Canadian Triage and Acuity Scale (CTAS), Emergency Severity Index (ESI), and Manchester Triage System (MTS) are thoroughly studied and show good to modest validity to identify high- and low-priority patients. Their performance may be significantly variant, although there is no clear association between ED patient number or case mix severity and triaging performance (Zachariasse et al. 2019: 2; Hinson et al. 2019: 141.) Regardless of high sensitivity when it comes to recognizing ED mortality patients, these systems have a likelihood of underperforming when identifying patients with critical illnesses or immediate death following the ED visit (Hinson et al. 2019: 141).

Triage is often subject to various influences, such as emergency nurses' experience and decision-making capacity, leading to inconsistencies in acuity allocation. Environmental constraints and the need for expedient decision-making can also affect the accuracy of triage assessments (Hinson et.al 2018: 2). Worldwide variation in triage schemes also limits benchmarking and homogeneity across regions (FitzGerald, Jelinek, Scott and Gerdtz 2010: 86). Interventions such as the integration of primary care clinicians into triage, including general practitioners and nurse practitioners, have been shown to improve patient flow outcomes, reducing time to first assessment and overall, ED length of stay (Jeyaraman et.al 2022: 2). In addition, intelligent system-based clinical decision systems (CDSS) development holds the promise to improve triage accuracy through the provision of objective rules based on clinical history data, though challenges remain in implementation (Fernandes et.al 2020: 2).

Guidance for triage assessment into the future is that further research needs to be carried out to identify the determinants that influence the performance of triage systems and to develop an International Triage Scale that may be applied for global benchmarking and research (FitzGerald et al. 2010: 90.) This would be through a concerted effort to maximize triage tools so they can be used uniformly across different healthcare settings. Additionally, more rigorous randomized controlled trials need to establish the

effectiveness of novel triage interventions before their universal use (Jeyaraman et al. 2022: 1).

The purpose of this study is to explore the competence and challenges emergency nurses encounter when conducting triage assessments. It seeks to produce new knowledge that can improve emergency nurses' in-service training programs, which will ultimately increase the accuracy and efficiency of triage in emergency care settings.

2 Background

2.1 Triage

Triage is a critical component of emergency care that focuses on the evaluation and ranking of patients according to the severity of their conditions. Its primary objective is to guarantee that individuals with the greatest clinical need are allocated the limited medical resources, particularly in cases where demand exceeds supply (Lauridsen 2020: 450). By ranking patients according to the urgency of their conditions, triage ensures that individuals requiring immediate attention receive timely care while those with less critical needs are managed appropriately (Aslanoğlu and Ayyildiz 2023: 317; Lauridsen 2020: 450.)

The historical evolution of triage systems reflects the changing needs and advancements in medical and emergency care. The term "triage", derived from the French word meaning "to sort," originated in military medicine during the Napoleonic Wars. Dr. Dominique Jean Larrey, a military surgeon, is credited with developing one of the earliest triage systems to prioritize the treatment of soldiers based on the severity of their injuries, laying the foundation for modern triage practices (Ali 2018: 113; Nakao, Ukai and Kotani 2017: 380; Johnson 2021: 193.) Initially, triage was primarily used in military settings to manage battlefield casualties. However, its application expanded over time to include civilian emergencies and disasters, adapting to the needs of diverse contexts and populations. (Johnson 2021: 195).

In the late 20th century, triage systems became more standardized and widely adopted in civilian healthcare settings. The development of protocols such as Simple Triage and Rapid Treatment (START) and its adaptations marked significant milestones in the evolution of triage systems. These protocols were designed to quickly assess and categorize patients based on the urgency of their medical needs, optimizing resource

utilization and improving patient outcomes (Aldossari and Bensaad 2024: 31; Bazyar, Farrokhi and Khankeh 2019: 483.) Today, triage systems are integral to emergency care worldwide, with numerous variations tailored to specific regional and institutional needs. Despite their diversity, the core principle of triage remains consistent: to provide the greatest good to the greatest number of people by efficiently allocating limited medical resources (Bazyar et al. 2019: 482; Peta et al. 2023: 815; Maiti and Easow 2024: 11.)

In emergency departments, triage is typically conducted by trained nurses who utilize their clinical judgment to evaluate patients and determine the urgency of care required (Aslanoğlu and Ayyildiz 2023: 317; Varndell, Hodge and Fry 2019: 82). This process is dynamic and continuous, demanding advanced diagnostic skills and a comprehensive understanding of various medical conditions to ensure accurate assessments (Aslanoğlu and Ayyildiz 2023: 317-318). Standardized triage systems, such as the Canadian Triage and Acuity Scale (CTAS) and the Emergency Severity Index (ESI), have been developed to enhance the reliability and consistency of patient prioritization (Hinson et al 2019: 141; Zachariasse et al. 2019: 1).

Despite its critical role, triage is not without challenges. Inconsistencies in performance and the potential for human error can affect its accuracy. While established triage systems generally demonstrate moderate to good validity, their effectiveness can vary significantly depending on the context (Zachariasse et al. 2019: 6-7). To address these limitations, there has been growing interest in integrating intelligent systems and clinical decision support systems (CDSS) into triage processes. These technologies aim to provide objective criteria for decision-making, thereby improving the accuracy and efficiency of triage assessments (Fernandes et al. 2020: 2; Mutegeki, Nahabwe, Nakatumba-Nabende and Marvin 2023: 983-984.)

In summary, triage is an essential component of emergency care, ensuring that patients with the most urgent needs receive timely medical attention. It relies heavily on the expertise of emergency nurses and standardized triage systems, with ongoing research focused on enhancing its accuracy and efficiency through technological advancements.

2.2 Role of nurses in triage

The nurse, as an emergency care frontline provider, plays a major role in assessing the situation of a patient before considering their care and prioritizing their treatment. This responsibility is not only associated with nurses working in acute care settings, but rather entails all clinical areas, and most times, nurses must perform these assessments frequently. (Solheim 2016: 218-219). Nurses play a key role in triage decision-making, which involves assessing and prioritizing patients based on the severity of their condition. One of their main roles is determining patient acuity and priority. This involves the assessment of signs and symptoms, identification of severe conditions, and determination of the risk of adverse clinical outcomes (Aslanoğlu and Ayyildiz 2023: 319-320; Reay, Rankin and Then 2016: 10). Triage nurses must balance adhering to established protocols with the need to adapt to the ever-changing environment of the ED (Fekonja et.al 2023: 5472).

In these situations, critical thinking is needed, which is defined by Alfaro-Lefevre (2016: 2) as “your ability to focus your thinking to get the results you need, making the difference whether you succeed or fail”. Nurse performing triage needs to merge both their clinical expertise and empathy to demonstrate critical thinking skills to ensure efficient patient care (Solheim 2016: 218). Typical critical thinking attributes that are vital during triage assessments. These include being inquisitive, looking out for detailed, accurate patient history, and using a methodical approach to synthesize information to conduct a suitable analysis (Solheim 2016: 219-220).

Another major responsibility is patient demand forecasting and management of space in the ED. Triage nurses must ensure new patients are taken in without losing focus on caring for the previous patients in the department. Management of space is necessary to maintain patient flow and optimize resource utilization (Reay et al. 2016: 11-12).

Communication and collaboration are also core to the work of triage nurses. They must collaborate with patients, caregivers, and other healthcare providers to facilitate seamless information exchange and coordinated service provision (Reblora, Lopez and Goh 2020: 573-574). This involves the use of context-specific judgment based on influencing factors of service delivery as well as ensuring that important decisions are understandable and implemented (Reblora et al. 2020: 568; Wouters et.al 2020: 1177.)

Finally, triage nurses must manage workload and stress effectively. The ED's stressful environment is often coupled with unpredictable patient volumes, which can lead to

burnout if not addressed. Peer feedback and organizational support are needed to help manage these issues and maintain patient safety (Fekonja et.al 2023: 5742).

Triage nurses must assess patient condition, control space, communicate efficiently, apply clinical judgment and critical thinking, and manage stress. All these responsibilities are crucial to guarding patients and working effectively in the ED.

2.3 Competence in triage assessment

Nurses' competence contributes significantly to patient outcomes, particularly in critical and emergency care. Advanced practice nursing roles, such as those in emergency departments, have been proven to improve outcomes like length of stay, consultation time, mortality, and patient satisfaction. The roles also decrease costs, making the argument for increasing nurse autonomy in healthcare (Woo, Lee and Tam 2017: 22.)

Nursing diagnosis is also a critical patient and organizational outcome predictor. They have been linked with improvement in quality of life, mortality, and organizational outcomes such as hospital lengths of stay and charges. The systematic application of nursing diagnosis to comprehensively assess the needs of the patient can enhance healthcare outcomes (Sanson, Vellone, Kangasniemi, Alvaro and D'Agostino 2017: 3373-3378.)

At the international level, professional nursing has been associated with reduced patient mortality and better chronic disease control. Nurse care is often found to have greater patient adherence to treatment and greater patient satisfaction compared to medical care. Most of the evidence comes from high-income countries, and therefore, there is a need for further studies in low- and middle-income countries (Coster, Watkins and Nor-man 2018: 76–81.)

Postgraduate nursing education is believed to enhance nurses' competence and knowledge, which are translated into enhanced clinical performance and patient out-comes. However, there is scant empirical proof to validate such assumptions, indicating the need for robust studies to measure the actual effect of postgraduate education on patient outcomes (Abu Qamar, Vafeas, Ewens, Ghosh and Sundin 2020: 2-3, 8-10.)

Nurse-initiated education interventions, particularly for chronic conditions like heart failure, have been shown to reduce readmissions and improve quality of life. The

interventions are a testament to the role of educational interventions in managing chronic dis-ease and improving prognosis among patients (Tian, Zhang, Rong, Ma and Yang 2024: 183-186.)

Empowered and collaborative nursing practices are also essential for high-quality patient care. Structurally empowered nurses who work collaboratively with other healthcare providers can significantly influence patient outcomes by tapping into their evidence-based knowledge and experience (Goedhart, Van Oostveen and Vermeulen 2017: 21-22.)

Finally, enhancing patient outcomes requires evidence-based practice. Educational intervention for increasing evidence-based practice in nurses has the promise to increase care quality and reduce challenges to produce direct impact (Wu et al. 2018: 113).

2.4 Challenges in triage

Emergency department triage nurses are faced with numerous challenges that impact how they effectively and promptly decide to treat patients. Some of the challenges are overcrowding, over-stressing, few resources to work with, and decision and communication complexities. All these are challenges to the effective delivery of triage, which translates into impacted patient outcomes accordingly. (Mulyadi, Dedi, Hou, Huang and Lee 2022: 16; Ausserhofer et.al 2021: 4-6; Suamchaiyaphum, Jones and Markaki 2024: 44.)

Overcrowding in emergency departments is perhaps the most emergent concern when it comes to managing triage. The COVID-19 pandemic exacerbated this problem further, as the hospitals were in trouble managing a backlog of patients presenting with signs of the disease (Mulyadi et al. 2022: 17-18; Wahyuningsih, Pratiwi and Herlianita 2022: 52.) Overcrowding not only puts tremendous stress on triage nurses but also amplifies the possibility of mistakes in patient evaluation and prioritization. The pressure to rapidly sort many patients can compromise the integrity of decision-making, with case misclassification and treatment delay risks (Ausserhofer et al. 2021: 6).

Maintaining accuracy is of utmost importance when performing triage assessment. Although several studies conducted reveal a noticeable amount of accuracy rates amongst nurses' decision-making. These rates range from 59.3 to 82 percent (Suam-

chaiyaphum et al. 2024: 50), which means that having sufficient experience is important to promote triage accuracy.

Furthermore, the capacity to make use of adequate resources is still a primary driver of triage performance. Many emergency departments have inadequate staffing, and this results in more workload for the available nurses (Mukhtar and Fadlallah, 2018: 17). The situation is even worse in some rural areas of many third-world countries with health inequities. Because there are no regular training programs and scarce medical resources, and therefore nurses are not able to make adequate triage decisions (Mould-Millman et.al 2021: 7.) Besides, structural and functional inefficiencies in emergency management to worsen these issues hence, making it difficult for the nurses to properly execute triage (Bijani and Khaleghi 2019: 5).

Nurses who work in triage are generally working under intense stress environments where they tend to make quick life-and-death decisions. Such levels of responsibility may lead to extreme stress and psychological burnout (Mulyadi et al. 2022: 19.) The need for effective communication is yet another reason that this stress will be heightened, as the nurses will need to communicate life-critical information to other nurses and patients without losing their cool (Reblora et al. 2020: 571). Additionally, emotional exhaustion caused by repeated exposure to stressful events, such as life-threatening injuries or near-critical disease phases, can cause mental fatigue and burnout (Ausserhofer et al. 2021: 6).

Globally, the problems that triage nurses face crowding, stress, resource scarcity, and decision-making issues, send a call for special interventions. Enhancing education programs, maximizing resource optimization, and providing psychological support to nurses are sure to improve the performance of triage in emergency settings significantly.

3 Purpose, aims and research question

The purpose of this study is to describe the competence and challenges among emergency nurses regarding triage assessment.

The aim is to produce new knowledge about nursing triage assessment that can be utilized to improve the level of in-service training for emergency nurses.

The research questions are:

1. What is the competence of emergency nurses regarding triage assessment in emergency care settings?

2. What are the challenges that emergency nurses encounter in applying triage assessment skills?

4 Methodology and methods

4.1 Data collection method

For this study, a descriptive literature review method was employed to examine the triage competence and challenges faced by registered nurses in emergency care. A literature review is a crucial method for defining research areas, as well as examining and integrating existing studies (Webster and Watson 2002). A descriptive literature review involves systematically identifying, reading, and evaluating publications to synthesize information and summarize the current knowledge on a given topic (Ebidor and Ikhide 2024). This method is particularly suitable for this qualitative research as it allows for a comprehensive understanding of the current knowledge, theories, and practices related to competence regarding triage assessment among nurses in emergency settings. It will support contributing to a cumulative research culture. (Yang and Tate 2012: 39).

Conducting a literature review is a multifaceted approach, but generally, a universal approach is utilized to ensure consistency. The first step is to determine the purpose of the review and the type of review being conducted (Snyder 2019: 336). A well-defined research question(s) is a guide to map search strategy, selection of search terms, using relevant databases, and having inclusion/exclusion criteria (Davies 2019: 337). The next phase involves refining search terms, screening abstracts, and employing backward and forward searches to detect applicable studies. This thorough process often requires multiple adjustments to ensure the final selection is in order with the objectives. (Juntunen and Lehenkari 2021: 333). The following phase is a meticulous analysis of selected literature, discovering key themes, extracting concepts, and organizing findings. Using structured approaches such as the PRISMA chart to report

findings. (Davies 2019: 338). The final phase is concluding the review, reporting the review process, the methodology used for the literature selection, and the synthesis of findings. A well-conducted review not only summarizes existing research but also gives a new idea on knowledge integration while providing useful information for research (Snyder 2019: 338).

4.2 Data search and selection

To ensure relevance to the research question and avoid deviation from the study's aim and purpose, the study used the PICo framework as outlined in (Table 1). The key concepts included nurses, challenges during triage, and strategies to address these challenges while performing triage in emergency settings. In this study, the PICo components were determined as below:

Table 1. PICo Tool

P- Population	**I-Interest**	**Co- Context**
Registered Nurses	Triage competence and challenges faced	Emergency care

The search strategy was designed using the PICo framework, with registered nurs-es as the population, triage competence and challenges faced as the interest, and emergency care as the context. Boolean operators ("AND", "OR") combined keywords using truncation (e.g., emergen, triage, assess, competen) to refine results. The scope of this review was limited to research published between 2020 and 2025 to capture the most recent developments in emergency care. Particularly in response to the COVID-19 pandemic, which significantly transformed triage and nursing protocols. Initial searches across CINAHL, MEDLINE, and manual searches yielded 305 records, nar-rowed to 10 final studies after screening titles (n=36), abstracts (n=18), and full texts (see Appendix 1 for search phrases).

To increase the validity and rigor of the review, inclusion and exclusion criteria (Table 2) were used to select the studies to include in the review based on their relevance to nurses' competence in triage assessment in emergency departments.

To ensure relevance and methodological soundness, studies were included or excluded based on the following:

Table 2. Inclusion and exclusion criteria

Inclusion Criteria	Exclusion Criteria
Nurses working in emergency care settings	Nurses who are not working in emergency care settings
Studies published in English language	Studies published in other languages
Research published between 2020 and 2025	Research published before 2020
Peer reviewed studies	Non peer reviewed studies
Studies related to triage	Studies unrelated to triage
Primary articles	Review articles

The PRISMA flowchart (Figure 1) shows the method of selecting articles from the databases. Based on the search sentences, a total of 305 records were identified through database searches, with 3 additional records through manual searching. After initial screening, 265 records that lacked two or more search phrases were eliminated following the first screening. A shortlist of 36 records was created for additional evaluation. 4 Duplicate records were removed, and the 30 records were considered for further evaluation based on their abstracts. Out of these 13 articles that did not align with the research questions were crossed out, and 18 abstracts were chosen for full-text assessment analysis. Following the full-text analysis of 12 papers, 2 were omitted that did not answer the research questions. Ultimately, leaving 10 articles for the final review. The summary of the results can be located in Appendix 1.

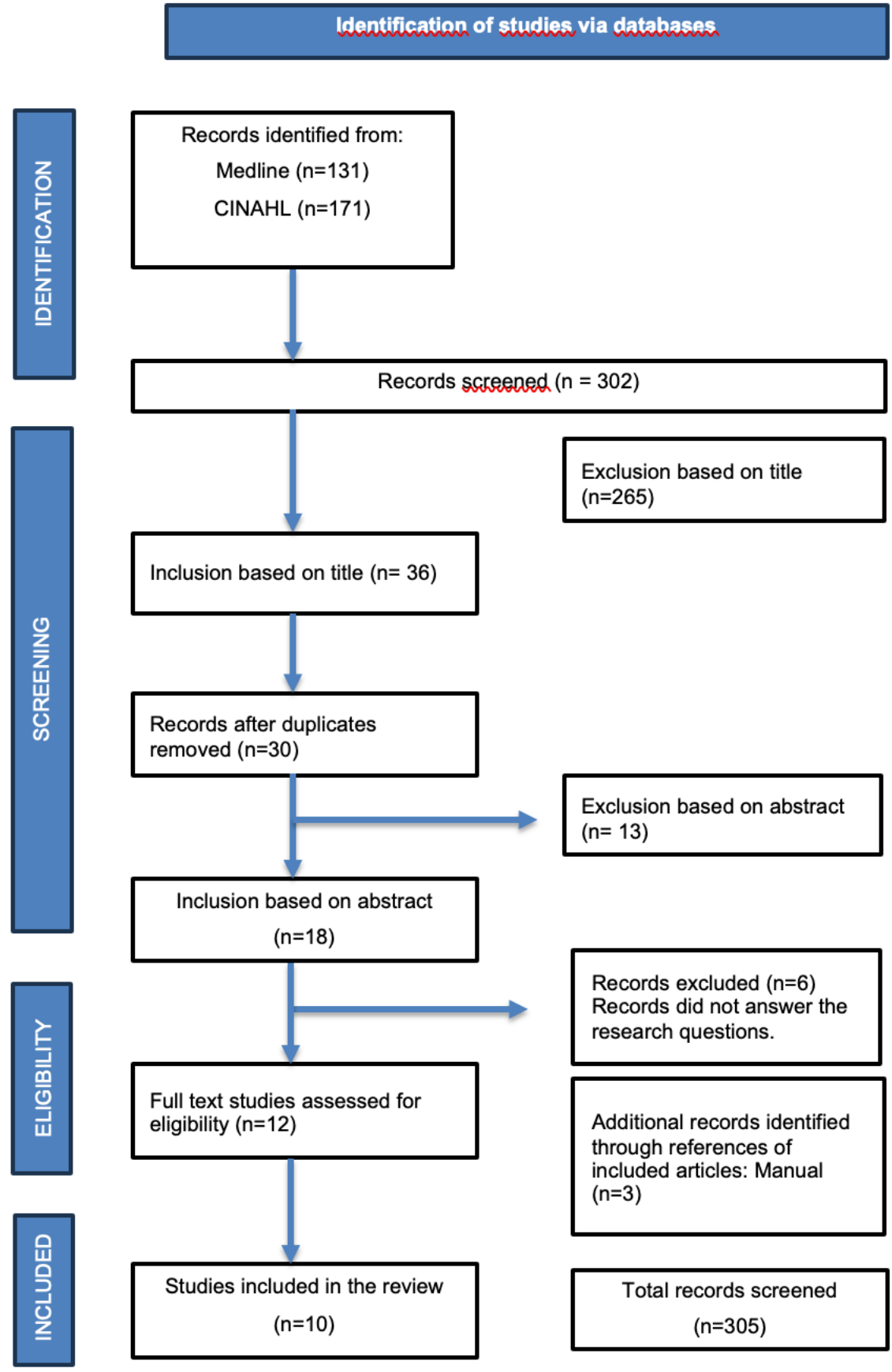


Figure 1. Prisma flow chart

4.3 Data analysis method

A qualitative data analysis method is based on assembling research data on a topic methodically from primary qualitative investigations and integrating the findings. The strategy constantly evolves and has lately improved significantly. This style of review evaluates data using the interpretive technique, which aids in yielding new information to formulate new theories to better understand or forecast a behaviour. (Seers 2012: 101).

Qualitative research, emphasizing the first-person perspective, offers the advantage in areas where numerical abstraction falls short. It excels in drawing out the individual richness of social and human phenomena by offering a holistic and refined approach (Kyngäs 2019: 13.) However, trustworthiness of qualitative research requires a systematic and detailed approach. This focuses on the integration of data-saturated content, analytical precision, and transparent reporting of results to achieve credibility and dependability of the study. (Elo and Kyngäs 2008: 112.)

Inductive content analysis illustrates the meticulous approach to qualitative research, serving as a lens for systematic organization and interpretation of textual data. The process begins by identifying meaning units: separate pieces of the text that convey specific ideas. These meaning units are then further simplified into codes that capture the fundamental insights from the meaning unit. Through a critical benchmarking process, similar codes are categorized into subcategories, which are finalized into generic categories. The final stage of this analytical process results in the creation of main categories, which serve as a comprehensive theoretical framework that addresses the research questions (Kyngäs 2019: 14.)

Data was collected from 10 scientific articles related to triage competence and challenges faced by nurses in emergency care settings. After reviewing all the data collected, meaning units were extracted from each article. These meaning units were converted into simplified phrases, ensuring that sufficient words represent the meaning of the data without losing its original meaning. These sentences were named codes and are one of the columns of the analysis table. A collection of open codes with common themes was placed in the same category. Several subcategories were further streamlined into multiple general categories and were then narrowed down into a main category to answer a research question. Two main categories were needed, one for each research question (see Appendix 3).

Table 3. below, presents a sample summary of key findings from two studies addressing triage competence (first row) and challenges (second row). The “meaning units” column show exact quotes related to the research questions taken directly from the studies. The “codes” column provides a short summary of key concepts taken directly from the studies without losing its actual meaning.

Table 3. Sample of a meaning unit and its extracted codes

Answer to research question:	Meaning Units	Codes
Answer to question number 1	“More than half of the participants (58.1%), with a 95% CI (51–65.3), had poor triage knowledge scores, with a mean score of 7.02 (± 2.025).” (Bahre et al. 2024).	Majority lack triage competency, Low baseline knowledge scores
Answer to question number 2	“Approximately one-fifth of the participants (19.4%) reported that secondary assessments could be unperformed or were rarely performed during triage, primarily owing to the heavy workload (71.4%)." (Yang et al. 2023).	Heavy workload limits secondary assessments.

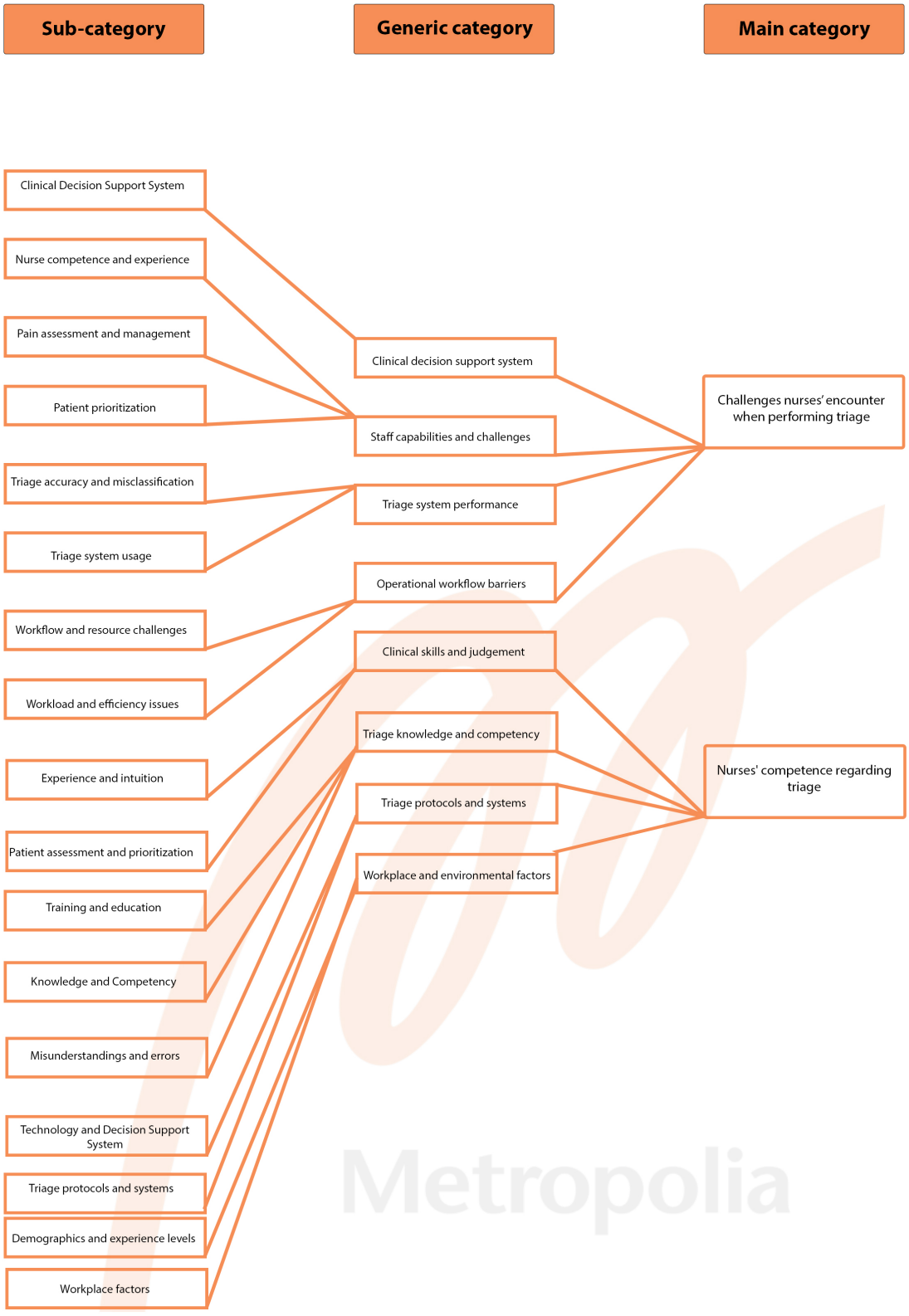
Table 4. displays the structured synthesis of qualitative and quantitative data from included studies. The “codes” extracted are grouped into sub-categories based on thematic similarity, which were further organized into broader generic categories to represent findings related to triage competence. The codes, sub-categories, and categories were reviewed to ensure logical coherence and alignment with the research questions.

Table 4. Codes are categorized into two subcategories and then into generic categories.

Codes	Sub-Category	Generic category
Triage knowledge and practice were not significantly affected by gender, job title, qualifications, or prior training	Demographics and experience levels	Workplace and environmental factors
Nurses with more emergency experience and formal training have better triage knowledge.		
Nurses with more triage experience and training demonstrate better triage practices.		
Gender influences triage competence.		
Nurses excelled in communication, management, decision-making, and coping but need improvement in professional evaluation.	Workplace factors	
Lack of standardized protocols and Resource gaps compromise care Infrastructure limits triage accuracy		
Work-related stress levels are significant.		
Regular audits ensure guideline effectiveness.		
Additional triage support improves patient prioritization but is rarely available.		
Extended shifts impact clinical judgment.		

Image 1. is an overall summary of all sub-categories and all generic categories into a main category. It gives an account of the cumulative process of inductive content analysis, beginning with the identification of meaning units, which were subsequently coded, grouped into subcategories, and then organized into generic categories, ultimately leading to the formation of the main categories. Given that the study was guided by two research questions, each main category corresponds to one of these questions.

Image 1. All sub-categories and generic categories grouped into main categories



5 Results

The reviewed literature provides a comprehensive overview of registered nurses regarding triage competence and the challenges faced. The selected studies span diverse geographical regions, including Saudi Arabia, South Korea, Ethiopia, Sweden, Jordan, South Africa, Canada, and China, thus giving a broad outlook on triage practices within varying healthcare systems. The data designs used were four qualitative studies and six quantitative studies. All studies were procured from databases CINAHL and Medline.

The collected data were analyzed and systematically categorized following the research questions. Through inductive content analysis, a total of two main categories (n=2), eight generic categories (n=8), and seventeen subcategories (n=17) were identified. The first main category, nurses' competence in emergency care triage (research question 1), was derived from four generic categories (n=4) and their associated subcategories. The second main category, challenges faced by nurses during triage in emergency care (research question 2), was also derived from four generic categories (n=4) and included nine subcategories (n=9) (see Appendix 3).

5.1 Registered nurses' competence in triage

This section presents the findings regarding the competence of emergency nurses in triage assessment within emergency care settings. The results are organized according to the following categories derived from the content analysis: registered nurses' competence in triage assessment, with subcategories clinical skills and judgement, triage knowledge and training, experience and education, and use of protocols and support systems.

5.1.1 Clinical skills and judgement

Clinical skills and judgment are vital to triage competence among emergency nurses. Numerous studies identify clinical reasoning as the most influential factor in triage performance. For instance, Hwang and Shin (2023: 3593) found that clinical reasoning competence, emergency department experience, work-related stress, and nurse–physician collaboration all significantly contributed to triage ability. Among these factors, clinical reasoning had the most positive impact. Moderate work-related stress was also associated with enhanced triage performance, possibly due to heightened

alertness in complex emergency scenarios. However, prolonged high workloads may result in fatigue, negatively affecting performance (Moon, Jeon and Ju 2021: 259; Reay, MacDonald, Then, Hall and Rankin 2020: 5; Phukubye, Mbombi and Mothiba 2021.)

A cross-sectional study conducted in Saudi Arabia, Ariffin, Mat and Yahya (2023: 137) reported that the surveyed nurses consistently demonstrated essential triage skills, such as assessing general condition, taking vital signs within 3–5 minutes, and being able to identify respiratory distress quickly. Similarly, Malak, Al-Faqeer and Yehia (2022: 3) also observed that 84.8% of emergency nurses in Jordan possessed moderate triage skills, with a significant positive correlation between triage skill level and both emergency and triage experience.

In another study, AlShatarat et al. (2022: 4) also noted that 98.6% of emergency nurses had a clear understanding of triage sorting principles, emphasizing triage's role in preventing deterioration in critical or life-threatening cases. Nurses with higher levels of clinical reasoning competence were better suited to handle patient data, prioritize care, and allocate resources (Hwang and Shin 2023: 3593–3594). Specifically, clinical reasoning competence explained the largest share of variance in triage performance among Korean emergency nurses. Similarly, Yang, Wan, Yu, and Li (2023: 3) highlighted that case discussions and secondary reviews contributed to better triage decision-making among emergency nurses in northern China, though the overall competence was still reported as very poor.

These quantitative findings are supported by qualitative research, which elaborates on the importance of expert assessment and timely decision-making although, extended exposure to triage tasks may lead to "triage fatigue," which can lead to compromising accuracy and overall competence (Reay et al. 2020: 5.) Experienced nurses frequently rely on intuition, personal competence, and their ability to interpret ambiguous symptoms to make accurate triage judgements (Moon et al. 2021: 259).

5.1.2 Triage knowledge and training

Triage knowledge, supported by structured and continuous training, is essential for effective triage practice. Several studies have reported that emergency nurses who participate in triage-specific education or refresher training programs tend to demonstrate stronger theoretical knowledge and greater confidence in clinical settings

(Malak et al. 2022: 3–5; Ariffin, Mat and Yahya 2023: 138; Bahre et al. 2023; Phukubye et al. 2021.)

In Jordan, for example, Malak et al. (2022: 3–5) found that 88.8% of emergency nurses achieved satisfactory scores in triage knowledge assessments. These scores were positively associated with completion of formal triage training, longer experience in emergency departments, and additional clinical certifications such as Basic Life Support (BLS) and Advanced Life Support (ALS). Despite these outcomes, 71.2% of the partici-pants had not received formal triage education.

Similarly, Ariffin et al. (2023: 137) reported that nearly all nurses surveyed in Saudi Arabia had completed triage-related education and were familiar with standardized tools such as the Canadian Triage and Acuity Scale (CTAS). The study emphasized the importance of incorporating triage education into orientation processes and ongoing professional development programs to maintain and deepen triage competence.

While theoretical knowledge levels were generally high, Malak et al. (2022: 3) noted that theoretical knowledge does not automatically translate into proficient practical performance. Therefore, scenario-based training is necessary to bridge the gap between knowledge and real-life application.

Similarly, AlShatarat et al. (2022: 4–5) discovered that emergency nurses typically exhibited high levels of triage knowledge and experience. The study demonstrated an established positive correlation between knowledge and practice, indicating that improved clinical practice is a result of improved theoretical understanding. However, incorrect triage practices and knowledge deficits were also identified.

5.1.3 Experience and education

Evidence from multiple studies consistently shows that nurses with greater clinical and emergency department experience demonstrate higher levels of triage knowledge and skill. In the Saudi Arabian study, 43.9% of nurses had 11–20 years of emergency department experience, and 92.7% held a bachelor’s degree in nursing (Ariffin et al. 2023: 137). These factors were associated with high levels of both knowledge and skill.

Consistent results were observed in the studies conducted in South Korea and Jordan that work experience in the emergency department and direct triage experience significantly affected performance. These studies advocate that structured orientation, men-

torship, and exposure to tertiary care environments can support less experienced nurses and further develop triage skills (Hwang and Shin, 2023: 3593-3594; Malak et al. 2022: 5.) Phukubye et al. (2021: 6) reported that organized, ongoing education contrib-uted to increases in both knowledge and self-assessed skill levels among emergency nurses in rural South African hospitals. Targeted training and repeated supervised practice were linked to improved triage competence in these settings.

Statistical analyses from Malak et al. (2022: 4) confirmed the positive associations between triage skills and both emergency and triage experience, including between triage knowledge and emergency experience. Similarly, Hwang and Shin (2023: 3593) reported that emergency department experience and triage experience were significant predictors of triage competence. Nurses with formal triage certification also demonstrated higher competence. Moreover, Yang et al. (2023: 4) found that male nurses and those with more participation in case discussions and secondary reviews had better triage performance, partly linked to greater clinical exposure.

Educational level was also linked to triage performance. According to Bahre et al. (2023: 7033), nurses with postgraduate qualifications (MSc degrees) demonstrated stronger triage knowledge compared to those with diplomas or bachelor's degrees. In regions where triage education was limited, rotational exposure to high-acuity centers, clinical supervision, and structured mentorship programs were reported to enhance experiential learning (Phukubye et al. 2021: 8).

5.1.4 Use of protocols and support systems

The implementation and use of standardized triage protocols, such as the Korean Triage and Acuity Scale (KTAS) or CTAS, are crucial in the nursing competence of triage. Findings from Sweden (Holmström, Kaminsky, Lindberg, Spangler and Winblad 2020: 3107-3108) highlighted the importance of clinical decision support systems (CDSS) in structuring the assessment process. Nurses appreciated that CDSS helped in difficult situations, such as when symptoms were vague or when they encountered rare emergencies, while also supporting collaboration across multiple care services. Importantly, CDSS did not restrict clinical autonomy; experienced nurses often adjusted system recommendations based on professional judgement, particularly in complex or ambiguous cases (Holmström et.al 2020: 3109.)

Bahre et al. (2023: 7033) emphasized that access to updated protocols, sufficient triage equipment (such as pulse oximeters and triage forms), and a supportive

interprofessional environment were critical components to facilitating effective triage. The literature also highlights the importance of regular review and updating of protocols, ongoing feedback, supervision, and administrative support to ensure adherence and adaptability to evolving emergency challenges (Moon et al. 2021: 259). Organizational support strategies, such as periodic audits and educational programs, were associated with sustained protocol adherence and improved triage outcomes (Moon et al. 2021: 259).

Additionally, individualized triage algorithms and structured orientation programs were reported to assist new nurses and those working in rural or low-volume emergency departments. Supporting these findings, Yang et al. (2023: 4) also noted that nurses familiar with triage guidelines and involved in routine secondary reviews exhibited better triage decision-making abilities.

Phukubye et al. (2021: 7–8) found that cross-departmental and inter-hospital rotations contributed to broader experiential knowledge among emergency nurses, further enhancing their capacity to utilize triage protocols effectively across varied clinical environments.

5.2 Challenges faced registered nurses in performing triage

The analysis of the literature revealed that emergency nurses face multiple challenges during triage, including workload and environmental pressures, resource and staffing limitations, communication difficulties, stress management issues, and barriers to maintaining triage accuracy and decision-making. Factors such as overcrowded departments, inadequate equipment, unclear communication structures, high emotional demands, and inconsistencies in training and triage algorithms all contribute to the challenges and difficulties of triage work in emergency settings.

5.2.1 Workload and environmental barriers

Emergency departments often face extreme overcrowding, resulting in high patient loads, fluctuating acuity levels, and unpredictable surges in demand. Nurses are subsequently tasked with managing patient volumes that exceed safe and manageable limits, which impairs their ability to deliver prompt and effective triage. Reay et al. (2020: 3) described how overcrowding forces nurses into "intra-category triaging," where prioritization must occur among patients of equal acuity, adding stress and increasing the risk of suboptimal outcomes. Ariffin et al. (2023: 137) further highlighted

that overcrowded departments, often filled with non-urgent cases, contribute to longer waiting times and pressure nurses to perform rapid triage assessments, thereby elevating the likelihood of errors. Frequent interruptions and the lack of time for comprehensive assessment were also reported as key barriers to triage accuracy (Reay et al. 2020: 4). Maintaining patient flow, balancing room availability, and responding to the logistical demands of a busy emergency setting were recurrent challenges cited by nurses (Reay et al. 2020: 3).

Environmental factors compounded these difficulties. Inadequate and overcrowded triage areas and the absence of private, dedicated spaces were commonly reported obstacles. AlShatarat et al. (2022: 4-5) emphasized that even among trained nurses, knowledge gaps led to inconsistent patient classifications. Similarly, Moon et al. (2021: 260) found that vague patient presentations complicated the application of triage scales such as KTAS, needing more systematic and structured training to reduce overreliance on intuition. Extended shifts and insufficient rest periods contributed to "triage fatigue," manifesting in cognitive fatigue and decreased attention spans, affecting triage performance (Reay et al. 2020: 3).

5.2.2 Resource limitations and staffing

In addition to environmental barriers, resource limitations and staffing shortages emerged as significant challenges. Nurses frequently encountered malfunctioning or unavailable essential equipment, such as thermometers, pulse oximeters, glucometers, and pain assessment tools (Bahre et al. 2023: 7032; Malak et al. 2022: 4). A lack of standardized triage guidelines and inconsistent access to updated assessment tools further worsened inconsistencies in patient evaluation (Malak et al. 2022: 4). Staffing deficits were particularly acute, with many departments assigning a single triage nurse to manage patient surges during peak times (Moon et al. 2021: 260).

According to Reay et al. (2020: 3), systemic misalignments between EMS services and emergency departments, where the imperative for rapid patient handover conflicted with thorough triage needs, heightened tensions, and inaccuracies. Limited administrative support and a lack of recognition for the complexity of triage roles are seen as contributing factors to burnout and staff turnover (Moon et al. 2021: 260). Newly deployed or less experienced nurses were often placed in frontline triage roles without adequate structured training, leaving them less prepared for the demands of emergency triage (Moon et al. 2021: 259).

5.2.3 Communication and stress management

Communication challenges and stress management issues further impaired triage effectiveness. Inefficient communication, rigid hierarchical structures between nurses and physicians, and the absence of clear collaborative protocols were recurrently identified as barriers that delayed decision-making (Hwang and Shin 2023: 3593). Managing distressed or aggressive patients and families also posed difficulties; misunderstandings about the triage process often escalated into hostility and complaints (Moon et al. 2021: 259-260). (Hwang and Shin 2023: 3593) further explained that language barriers, confrontational family members, and poor interprofessional communication as significant contributors to triage errors. Differing clinical judgments between nurses and physicians led to delays, emphasizing the need for stronger teamwork.

Holmström et al. (2020: 3108) reported added delays caused by inefficient communication with external services such as ambulance operators and helplines. Emotional stress, cognitive overload, and burnout were persistent problems impacting triage accuracy (Hwang and Shin 2023; Ariffin et al. 2023: 137; Reay et al. 2020: 3).

5.2.4 Triage accuracy and decision-making issues

Issues surrounding triage accuracy and decision-making were repeatedly linked to inconsistent training, varying experience levels, and ambiguities within triage algorithms. In many contexts, a sizable proportion of nurses were found to have suboptimal triage knowledge, with rates exceeding 50% in several regions (Bahre et al. 2024: 7032). Nurses with less than three years of experience or lower educational backgrounds were particularly prone to inaccuracies (Bahre et al. 2024: 7033-7034).

Ambiguities within triage categorization tools themselves presented major challenges. Moon et al. (2021: 260) explained that vague criteria within systems like KTAS complicated decision-making for complex patient cases, highlighting the need for enhanced systematic training and algorithm updates. Additionally, the absence of staged, progressive educational programs left a gap between novice and expert performance, with many nurses expressing a strong demand for flexible, technology-based learning options (Moon et al. 2021: 260).

Administrative and systemic pressures also influenced by triage judgments. Reay et al. (2020: 5) noted that triage scales were sometimes interpreted loosely, with decisions occasionally reflecting institutional output goals rather than purely clinical needs. Although Clinical Decision Support Systems (CDSS) were seen as helpful, Holmström et al. (2020: 3109) observed that outdated technology and lack of situational awareness often limited their utility. Without structured, ongoing education, seniority alone was insufficient to maintain important levels of triage ability (Phukubye et al. 2021: 6).

6 Discussion

6.1 Main results

The purpose of this descriptive literature review was to describe the competence and challenges nurses face when performing triage assessments in emergency care settings.

According to the results of our literature review, many nurses demonstrate solid clinical judgment, triage knowledge, and practical skills, particularly those with vast experience and specialized training. This remains significant across different settings and countries. Factors such as clinical reasoning ability, ongoing education, teamwork, and stress levels were found to have strong associations with triage competence. However, the challenges commonly reported include high workload, resource limitations, communication challenges, and inconsistent or outdated training and protocols.

The findings of this study affirm the acknowledged influence of clinical reasoning, education, and structured protocols on triage competence, a conclusion that matches with the studies of Hinson et al. (2019: 140-141) and Zachariasse et al. (2019: 1-2). These studies established the Emergency Severity Index (ESI), Canadian Triage and Acuity Scale (CTAS), and Manchester Triage System (MTS) as moderately to highly valid tools for prioritizing patient care. In line with these findings, this thesis identifies that emergency nurses equipped with robust clinical reasoning and familiarity with formal triage systems consistently demonstrate superior triage performance. Solheim (2016: 219-220) emphasizes the skills that clinical reasoning contributes more significantly to triage efficacy than other variables, a theme repeatedly mentioned in the analyzed literature.

Furthermore, the role of structured training and education emerged as a crucial determinant of triage competency, reinforcing conclusions drawn by Abu-Qamar et al. (2020: 2-3) and Woo et al. (2017: 2-3). This study observed that nurses who engaged in formal education, continuing professional development, or triage-specific simulation training exhibited higher theoretical knowledge and superior practical execution. This also reflects the link between experiential learning, cognitive integration, and professional outcomes, and affirms scholarship provision for the elevation of nursing autonomy through educational empowerment (Coster et al. 2018: 81)

The challenges mentioned in this study; environmental stressors, staff shortages, and resource limitations mirror the findings of Mulyadi et al. (2022: 17-18) and Ausserhofer et al. (2021: 6). Both the present studies and the previous literature converge on the conclusion that overcrowding in emergency departments not only affect the accuracy of triage decisions but also elevates psychological stress and risks of clinical burnout. Suamchaiyaphum et al. (2024: 50) quantitatively estimated triage decision accuracy to range between 59.3% and 82%, highlighting the exposed irregularities influenced by such stressors. These issues are particularly acute in low-resource settings where inadequate staffing and outdated equipment constrain nurses' ability to triage effectively, as noticed in the literature from Mukhtar and Fadlallah (2018: 17) and Mould-Millman et al. (2021: 7).

The absence of standardized institutional protocols was another key issue. This aligns with earlier findings (Bijani and Khaleghi 2019: 5) were poor infrastructure and lack of systematized triage procedures significantly reduced nurse performance, particularly in environments with inadequate resources.

Communication inefficiencies between nurses and physicians were frequently noted and are supported by earlier literature (Reblora et al. 2020: 573-574; Hwang and Shin 2023: 3593). Our study's results confirm that improper communication channels and hierarchical barriers between members of a multiprofessional team can delay or distort triage decisions.

This study presents the concept of "triage fatigue," a condition in which mental agility deteriorates as a result of repeatedly making important decisions under time pressure. Our results indicate that this is a unique type of decision-making fatigue that has not been previously highlighted in triage studies.

Prior work from Fernandes et al. (2020: 2) highlighted the potential of Clinical Decision Support Systems (CDSS) to improve triage accuracy. This study reveals findings that are largely consistent with existing research. Nurses interviewed in Sweden (Holmström et al. 2020: 3108) demonstrated a balanced perspective appreciating CDSS as a useful guide while still relying on clinical intuition when necessary. This aligns with broader discussions on the association between technological inclusion and professional autonomy, a theme presented in prior literature but explored here comprehensively. The ability to recognize and acknowledge these dynamics reflects a new ideology, proving the need to deeply engage with emerging healthcare technologies.

Collectively, the results of this literature review align with previous studies by confirming both the competence and challenges that registered nurses face when performing triage in emergency care settings.

6.2 Limitations of the study

While this study provides valuable insights into triage competence and challenges, it is not without limitations. One of the primary limitations lies in the geographic scope of the studies. The majority originate from non-European contexts, which raises a question of whether findings apply to European healthcare systems, as triage protocols and organizational factors differ across regions (Peta et al. 2023: 814). Additionally, the study relied on a descriptive literature review method, which, while comprehensive, does not involve primary data collection and may therefore overlook perspectives from nurses in underrepresented settings. The scope of the study is also restricted by the limited number of included articles, many of which are cross-sectional, region-specific, and rely heavily on self-reported data, potentially introducing bias such as social desirability and response bias, which can limit generalizability, especially to low-resource settings. However, despite these limitations, the results of the reviewed studies provide valuable insights into the competence and challenges registered nurses face in triage. The studies utilized evidence-based cross-sectional quantitative designs, qualitative descriptive methods such as focus group interviews, and instrument validation procedures such as Cronbach's alpha to assess the reliability of the research instruments. These methodologies collectively provided a comprehensive background for examining the triage competency of registered nurses and the challenges faced.

6.3 Validity and ethics

This study, as a literature review, does not involve direct human subjects nor the collection of primary data, hence refraining from needing ethics committee clearance. Peer-reviewed articles were the focal point in data sourcing and evaluating the findings across the recognized concepts. Therefore, to ensure validity, an extensive assessment of the methodologies and instruments used was used in the studies. Chetwynd (2022: 392) interprets that validity is associated with whether a study proves what it claims and is backed by theoretical and empirical evidence. We had guidance from our supervisors and attended seminars that provided lessons on how to write the best thesis. Furthermore, members of this review analyzed the gathered results independently before determining what was presented to ensure credibility and minimize bias. All analyzed studies were selectively acquired from the databases and tools provided by our University of Applied Sciences, ensuring the relevance and reliability of the sources. Reliability was assured by documenting the entire research process transparently, allowing for replication by another researcher (Middleton 2023).

The literature review was done under the Ethical Recommendations for Thesis Writing at Universities of Applied Sciences (Arene) and the principles set by the Finnish National Board on Research Integrity (TENK), which particularly insist on honesty, objectivity, and proper attribution of sources. The internet-based plagiarism detection software Turnitin was used to measure authenticity, and appropriate credit and citations were used to reference authors according to the Metropolia Guidelines for written work (TENK 2023.)

The Joanna Briggs Institute (JBI) Critical Appraisal Tools were used to appraise the content of the studies, depending on the type of research. This is a framework that is valuable for assessing different types of studies, including systematic reviews, qualitative research, and cohort studies (Aromataris and Munn 2020). The JBI approach evaluates key areas which include research design, sampling methods, data collection, validity, and potential biases (JBI 2020). Applying JBI critical appraisal ensures that the literature review is supported by superior quality, evidence-based research, potentially lowering the risk of inaccuracy and reinforcing the validity of unified conclusions (JBI 2020).

6.4 Conclusions, utilization of the results and recommendations

Throughout this thesis, we have examined a range of studies to identify the need study to understand both the triage competence among registered nurses and the challenges faced that affect effective triage assessments in emergency settings.

Key findings from this thesis reveal considerable variability in triage competence, with stronger performance consistently associated with higher levels of clinical reasoning, structured and ongoing training, and professional experience. Challenges, including heavy workloads, lack of standardized protocols, resource limitations, and inconsistencies in interprofessional communication, were frequently reported as significant barriers to optimal triage performance. These barriers not only compromise clinical decision-making but also have implications for patient safety and care efficiency.

The significance of these results lies in their contribution to the broader understanding of how nurse competence and systemic factors interact in emergency care. The emphasis on clinical reasoning and structured training suggests that healthcare organizations should prioritize ongoing professional development programs for nurses.

Moreover, these findings challenge existing theories by highlighting the limitations of current triage systems. For example, the study by Holmström et al. (2020) found that nurses often overruled Clinical Decision Support System (CDSS) recommendations based on their clinical judgment, suggesting that while technology can support triage decision-making, it is not a replacement for human expertise. There is a need for a balanced approach that leverages both technological tools and clinical judgment. Moreover, integrating current training programs such as Advanced Trauma Life Support (ATLS) and Advanced Trauma Care for Nurses (ATCN) into continuing education can equip nurses with key knowledge and skills to manage challenging situations.

Solving systemic issues in the emergency department is also essential in enabling effective management of triage. One of the largest obstacles to efficient triage is inadequate staffing of nurses, which results in heavy workload and decisional fatigue. Institutional healthcare organizations need to encourage increased nurse-to-patient ratios for less stress and better triage accuracy. Increased interprofessional practice, with a focus on between-physician and between-nurse collaboration, may also better coordinate triaging activities and enhance patient outcomes. Investment in clinical

decision support systems (CDSS) is also likely to provide nurses with evidence-based protocols, leading them to timelier and more accurate triaging.

The availability of emergency room resources significantly influences the effectiveness of triage management. Healthcare facilities' emergency rooms must be adequately equipped with basic triage devices and diagnostic supplies to assist nurses in their assessments. Regulations must be established to standardize triage procedures across different healthcare facilities and minimize inconsistency, thus ensuring an equivalent level of patient priority strategy. The integration of technology-driven solutions, such as computerized decision-support systems and mobile apps, also can augment triage decision-making, particularly where high-pressure situations demand rapid assessment.

One of the most important areas of future research is the impact of triage training interventions. Research needs to evaluate the long-term impact of various models of triage training on the level of competence among nurses and patient outcomes overall. It can guide the optimal educational strategies and improve skill retention among nurses by determining which training methods yield the best results.

We also recommend that research should investigate the capability of artificial intelligence (AI) and machine learning to enhance the accuracy and effectiveness of triage. Technology can assist hospitals in designing complex decision-support systems that allow nurses to offer rapid and evidence-based triage assessments. Research must also examine the effect of workload and stress on the accuracy of triage, as high patient volumes and stressful working environments affect decision-making and patient prioritization consistency.

Comparative studies from different healthcare systems would also provide insight into the best practices for triage education and policy implementation. Through a comparison of the way different countries train and execute triage, researchers can derive effective strategies that can be transported across different settings of healthcare.

In summary, this thesis highlights the complex nature of triage competence and the persistent challenges faced by emergency nurses. The findings demonstrate the importance of ongoing investment in nurse education, interprofessional collaboration, and systemic support as critical avenues to enhance patient outcomes and strengthen emergency care systems worldwide.

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Appendices

Appendix 1. Database search results

Database	Search sentence	Total number of hits	Papers/ records included based on title	Papers/ records included based on abstract	Papers/ records included based on full text
CINAHL	(emergen*) AND (triage) AND nurs* AND (assess* OR evalua* OR classif*) AND (knowledge OR competen* OR skills OR expertise)	131	21	9	4
MEDLINE	(emergen*) AND (triage) AND nurs* AND (assess* OR evalua* OR classif*) AND (knowledge OR competen* OR skills OR expertise)	171	12	7	4
Manual search		3	3	2	2
Limiters	Years: (2020– 2025), English language, peer reviewed				
Records in total		305	36	18	10

Appendix 2. Results of content analysis (research questions 1 and 2)

Sub-category	Generic category	Main category
Experience and intuition	Clinical skills and judgement	Nurses' competence regarding triage
Patient assessment and prioritization		
Training and education	Triage knowledge and competency	
Knowledge and Competency		
Misunderstandings and errors		
Technology and Decision Support System	Triage protocols and systems	
Triage protocols and systems		
Demographics and experience levels	Workplace and environmental factors	
Workplace factors		

Sub-category	Generic category	Main category
Clinical Decision Support System	Clinical decision support system	Challenges nurses' encounter when performing triage
Nurse competence and experience	Staff capabilities and challenges	
Pain assessment and management		
Patient prioritization		
Triage accuracy and misclassification	Triage system performance	
Triage system usage		
Workflow and resource challenges	Operational workflow barriers	
Workload and efficiency issues		

Appendix 3. Summary of reviewed articles

Author (s), year, country	Topic/Title	Methodology and Methods	Participants	Main Outcomes	JBI critical appraisal checklist
1 AlShatarat, Rayan, Eshah, Baqeas, Jaber and ALBashtawy. 2022 Saudi Arabia	"Triage Knowledge and Practice and Associated Factors Among Emergency Department Nurses."	Cross-sectional quantitative study	n = 235 emergency nurses	The study discovered strong levels of knowledge and practice among ED nurses even so gaps in knowledge such as mist misinterpretation of AVPU (68.7%) and incorrect waiting time for Priority 4 patients (87.1%) was identified. Challenges in triage assessment were incorrect practices, under and over triage and improper role assignation. There is the need for continuous development to improve knowledge and reduce errors.	Analytical cross sectional appraisal Checklist 1. Yes 2. Yes 3. Yes
2 Ariffin, Mat and Yahya. 2023 Saudi Arabia	"Knowledge and Skills in Triage Assessment among Nurses in Emergency Department Hospital Saudi Arabia."	Descriptive study using cross-sectional questionnaires for non-random sampling. Quantitative approach.	n=41, Emergency department nurses	The study found that nurses in ED in Saudi Arabia had adequate levels of triage competence. with all respondents (100%) familiar with the Canadian Triage and Acuity Scale (CTAS). Inconsistencies such as misclassification of severe pain cases (14.6%) and failure to inform patient about waiting times (12.2%), under and over triage and poor management of stressful environments. Study recommends training services to improve competency.	Analytical cross sectional appraisal Checklist 1. Yes 2. Yes 3. Yes

3 Bahre, Mengist, Bitsa, Woldemariam, Kebede, Wubete and Bantie. 2023 Ethiopia	“Triage knowledge, perceived skills, and associated factors among nurses working in adult emergency departments of selected public hospitals in Addis-Ababa, Ethiopia, 2023”	Multicenter cross-sectional study, Quantitative study	n= 384 participants (emergency department nurses) from three hospitals.	The study found out that emergency nurses in Addis-Ababa had inferior competence in triage assessment and 50.3% had poor judgment in triage skills. Factors influencing triage competence included educational level, triage experience, training experience, and the availability of triage equipment. Nurses who attended workshops and trainings demonstrated higher competence that others. Study suggests further professional development to improve competence.	Analytical cross sectional appraisal Checklist 1. Yes 2. Yes 3. Yes
4 Holmström, Kaminsky, Lindberg, Spangler, and Winblad. 2020, Sweden	“Registered Nurses' experiences of using a clinical decision support system for triage of emergency calls: A qualitative interview study.”	Qualitative study, descriptive design with a qualitative inductive approach.	n=24, Registered nurses,	The Registered Nurses generally perceive the Clinical Decision Support System (CDSS) as a supportive tool rather than a restriction on their professional autonomy. RNs often overruled CDSS recommendations based on their clinical judgement when they sensed something is not right. Some challenges are operational inefficiencies (like double documentation and time pressure) and decision overruling (should nurses follow the CDSS or their competence).	Qualitative Appraisal Checklist 1. Yes 2. Yes 3. Yes
5 Hwang and Shin. 2022, South Korea	“Factors affecting triage competence among emergency nurses”	Cross sectional design, Quantitative study	n= 156 emergency room nurses	The study discovered that triage competency is greatly influenced by clinical reasoning proficiency, work-related stress, nurse-physician collaboration, and emergency department experience. Higher levels of triage competency were shown by nurses with more ED experience.	Analytical cross sectional appraisal Checklist 1. Yes 2. Yes 3. Yes

6 Malak, Al-Faqeer, and Yehia. 2022, Jordan	“Knowledge, Skills, and Practices of Triage among Emergency Nurses in Jordan”	A cross-sectional, descriptive correlational, observational design through Self-structured questionnaire and observation. Quantitative study	n= 150 questionnaires submitted to emergency. However, after reviewing of survey results only 125 were assessed	The study evaluated Jordanian emergency nurses' triage-related knowledge, abilities, and practices. 88.8% of nurses had adequate understanding of triage, 84.8% had moderate triage abilities, and 88.8% had effective triage practices, according to the data. Triage knowledge, skills, and behaviors were found to be significantly positively correlated with emergency experience, triage experience, and triage training courses. The study emphasized the value of ongoing triage training programs to improve patient outcomes, nurses' competence, and obstacles to triage implementation, particularly the emergency department's lack of specific tools and resources.	Analytical cross sectional appraisal Checklist 1. Yes 2. Yes 3. Yes
7 Moon, Jeon and Ju. 2021, Republic of Korea	“Facilitators and Barriers of the Triage Process based on Emergency Nurses’ Experience with the Korean Triage and Acuity Scale: A Qualitative Content Analysis”	A Qualitative Content Analysis, focus group interviews	n=20, nurses were divided into two junior and four senior groups based on their level of clinical experience.	The study found out that emergency nurses faced triage challenges due to varying competence, time limitations, stress, and communication barriers. Inconsistent training and limited equipment reduced accuracy. Structured training improved competence. The study recommends better training, resources, and communication to enhance triage.	Qualitative Appraisal Checklist 1. Yes 2. Yes 3. Yes

8 Phukubye, Mbombi, and Mothiba. 2021, South Africa	“Strategies to Enhance Knowledge and Practical Skills of Triage amongst Nurses Working in the Emergency Departments of Rural Hospitals in South Africa.”	Qualitative descriptive study. Non profitability sampling method	n= 17, Emergency nurses in rural areas who conduct triage.	The study aimed to determine ways to improve the triage knowledge and practical abilities of nurses employed in South African rural hospitals' emergency departments (EDs). In order to enhance nurses' knowledge and abilities, the results highlight the value of ongoing training through workshops, refresher courses, and the creation of a triage module. The study also highlighted the importance of clinical supervisors in improving triage practices, the necessity of clear protocols, and benchmarking with other hospitals. The findings imply that such approaches can significantly enhance patient outcomes and the standard of emergency care in rural areas.	Qualitative Appraisal Checklist 1. Yes 2. Yes 3. Yes
9 Reay, Smith-MacDonald, Then, Hall, and Rankin. 2020, Canada	“Triage emergency nurse decision-making: Incidental findings from a focus group study”	Group focus study, Qualitative study	n=11, Triage-trained emergency department (ED) registered nurses	The study revealed three key factors affecting triage decision-making: competing systems (EMS vs. ED demands), fluctuating patient volume leading to "intra-CTAS" triage, and personal capacity, including experience and triage fatigue. These interconnected challenges highlight the need for systemic improvements, better inter-professional collaboration, and enhanced support for triage nurses to ensure effective and safe patient prioritization in emergency departments.	Qualitative Appraisal Checklist 1. Yes 2. Yes 3. Yes
10 Yang, Wan, Yu, and Li. 2023, China	“Factors affecting the triage decision-making ability of emergency nurses in Northern China: A multi-center descriptive survey.”	Quantitative study, A cross-sectional, multi-center survey	n=404, 371 valid questionnaires submitted (91.83). Emergency nurses from	The study found that emergency nurses in northern China have low triage decision-making ability, influenced by gender, case discussions, secondary assessments, and familiarity with triage consensus. Triage training is poorly implemented and outdated. Recommendations include updating training methods, focusing on simulations and case discussions, and improving	Analytical cross sectional appraisal Checklist 1. Yes 2. Yes 3. Yes

			tertiary hospitals	consensus implementation to enhance decision-making skills and patient outcomes.	

JBI Quality Appraisal Questions

Qualitative study:

1. “Is there congruity between the research methodology and the methods used to collect data?”
2. “Is there congruity between the research methodology and the research question or objectives?”
3. “Is there congruity between the research methodology and the methods used to collect data?”

Analytical cross-sectional studies:

1.” Were the criteria for inclusion in the sample clearly defined?”
2.” Were the study subjects and the setting described in detail?”
3.” Was the exposure measured in a valid and reliable way?”