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Walden University

College of Management and Human Potential

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Strategies to Reduce Prolonged Emergency Department Length of Stay and Improve

Outcomes for Elderly Patients

by

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Abstract

Prolonged emergency department (ED) length of stay (LOS) among elderly patients is a complex and escalating challenge that calls for immediate strategic action from healthcare administrators seeking to improve outcomes and system efficiency. The purpose of this integrative review is to identify evidence-based strategies to optimize emergency department quality of care for elderly patients in acute hospital settings by examining systemic, clinical, and operational contributors to extended ED stays. A comprehensive review of literature published between 2021 and 2025 was conducted using systematic search and appraisal methods. Findings from the 12 peer-reviewed studies included in the final analysis were appraised using the Johns Hopkins Evidence-Based Practice (JHNEBP) appraisal tools to evaluate methodological quality and content relevance. Thematic analysis yielded four major themes and twelve subthemes. The primary themes included Capacity and Throughput Optimization; Workforce and Care Coordination Redesign; Geriatric-Centered Emergency Care Models; and Safety, Transitions, and Outcome Optimization. Key subthemes informing these domains included emergency department boarding reduction strategies, geriatric-sensitive triage processes, technology-enabled risk identification, and discharge transition planning. Guided by Donabedian's structure-process-outcome model and general system theory, this review offers strategic recommendations to optimize throughput, integrate frailty screening, and reimagine ED processes with elderly care in mind. These changes have the potential to enhance patient safety, reduce health disparities, and restore dignity in the care delivered to aging adults in emergency settings.

Part 1: Practice-Based Problem

Problem of Interest

Emergency departments nationwide are under mounting pressure as the surge in elderly patients challenges existing workflows, resources, and standards of timely care. Many of these individuals present with frailty, a dynamic state of vulnerability that increases their risk of complications during and after emergency department (ED) visits. Iozzo et al. (2024) found that up to 60% of older adults who visit the ED are frail, and this group is disproportionately affected by prolonged ED length of stay (LOS), higher admission rates, and increased mortality. These risks are often compounded by systemic issues, such as limited inpatient bed availability, inadequate care coordination, and the absence of standardized protocols for assessing frailty. Prolonged ED LOS, especially beyond the 6-hour benchmark, has been associated with up to an 8% increase in 30-day mortality (Choi et al., 2021; Jones et al., 2022). Despite the severity of these outcomes, many hospital systems have not adequately addressed the operational and clinical factors contributing to extended LOS among elderly patients. This integrative review is necessary to synthesize evidence-based strategies that support the delivery of quality care and facilitate timely transitions for this vulnerable population. Addressing this problem has the potential to drive meaningful, positive social change by improving safety, reducing age-related health disparities, and promoting dignity in the delivery of emergency care to older adults.

Healthcare Administration Problem

Background

Since the early 2000s, emergency departments (EDs) in acute hospitals have struggled with rising patient volumes among elderly patients, leading to prolonged ED length of stay (LOS). In South Carolina and nationwide, hospital occupancy regularly exceeds 85%, often reaching 100%, leading to systemic bottlenecks that delay care transitions for elderly patients (Press & Throp/side, 2025). Additionally, prolonged ED LOS has been associated with higher mortality and poor outcomes among vulnerable individuals. Choi et al. (2021) found that ED LOS exceeding 6 hours is associated with an 8% increase in 30-day mortality among critically ill elderly patients. As South Carolina hospitals continue to face escalating demand and throughput challenges, these delays compromise patient flow and put vulnerable populations at risk.

In recent years, an increasing number of patients have experienced extended waits, sometimes lasting hours or even days, for inpatient admission following an ED visit. To illustrate that this is an ongoing issue, Jones et al. (2022) reported that by 2019-2020, more than 3.2% of all emergency department patients experienced wait times exceeding 12 hours from the time of their arrival. Bronk (2023) further emphasizes that ED boarding contributes to delayed treatment, increased patient harm, and staff burnout, reinforcing the systemic and operational nature of the crisis. These delays are not only clinical red flags but also indicative of systemic operational breakdowns, underscoring the urgent need for administrative strategies to address inefficiencies in bed management, staffing, and care coordination.

Operational Problem

The prolonged length of stay (LOS) in emergency departments presents a significant operational challenge for acute hospitals, particularly for elderly populations. Operational inefficiencies, such as inadequate bed turnover processes, delayed discharges, and poor coordination between the ED and inpatient units, contribute directly to extended ED LOS. These issues create a ripple effect throughout the healthcare system, compounding patient backlogs and straining clinical resources. Choi et al. (2021) found that elderly patients who remained in the ED for over 6 hours had an 8% higher 30-day mortality rate, emphasizing how modest delays can result in fatal outcomes. Similarly, Jones et al. (2022) demonstrated that mortality risk increases incrementally with each hour of admission delay, linking extended LOS to serious clinical consequences. Operational breakdowns are further exacerbated by ED boarding, which, according to Bronk (2023), not only leads to delays in care but also to medication errors, missed treatments, and staff burnout. These patterns reveal a pressing need for hospital administrators to implement streamlined throughput strategies, improved discharge planning, evidence-based geriatric care models, and coordinated bed management protocols to reduce LOS and safeguard vulnerable populations.

Ideal State of Operations

The 4-hour standard set by the National Health Service in the United Kingdom establishes guidelines for emergency departments. For acute hospitals to maintain emergency department (ED) length of stay (LOS) within safe, evidence-based

timeframes, preferably under four hours, for elderly patients, they must ensure care that is both timely and tailored to their unique needs. Burgess et al. (2021) found that prolonged ED LOS is associated with adverse outcomes such as increased mortality, inpatient length of stay, and delayed treatment, particularly among elderly populations. To achieve optimal outcomes, hospitals must implement streamlined care transitions, proactive discharge planning, and geriatric-specific assessment protocols to support efficient and coordinated care delivery. This includes timely triage, interdisciplinary care planning, and early recognition of frailty to ensure older adults are promptly admitted, transferred, or discharged with appropriate support. By targeting these operational improvements, hospitals can enhance the quality of care, reduce clinical risks, and ensure that EDs function as high-performing, patient-centered access points for acute care.

Professional Practice Gap Statement

Evidence shows that emergency department (ED) length of stay (LOS) exceeding 6 hours is associated with an 8% increase in 30-day mortality among elderly patients, surpassing the American College of Emergency Physicians' (ACEP) recommended 4-hour standard for timely care. This study will examine administrative strategies to align emergency department length of stay (ED LOS) with national benchmarks and enhance outcomes for elderly patients in acute hospital settings.

Summary of Evidence

As the healthcare industry continues to evolve, a growing body of literature consistently demonstrates that prolonged emergency department (ED) length of stay (LOS) poses serious risks to elderly patients and presents a critical challenge to

healthcare administration, particularly in acute hospital settings. The problem, while industry-wide, is especially pronounced in high-volume EDs across South Carolina, where hospital occupancy frequently exceeds 85%, creating systemic delays in admissions and care transitions. Choi et al. (2021) conducted a multicenter study showing that when ED LOS exceeds six hours, there is an associated 8% increase in 30-day mortality among critically ill elderly patients. Additionally, Jones et al. (2022) found that mortality rates begin to rise after just 5 hours in the ED, with each subsequent hour further increasing the risk. These findings underscore the need for administrative action to optimize care pathways and minimize bottlenecks that affect this vulnerable population.

Furthermore, Bronk (2023) highlights how ED boarding contributes to delayed treatment, patient harm, and clinician burnout, further validating the significance of this operational failure. These issues not only compromise clinical care but also reflect a breakdown in performance improvement, service coordination, and patient safety, all key domains within the American College of Healthcare Executives (ACHE) competencies. Although multiple clinical guidelines have recommended frailty screening and geriatric-focused care protocols, most EDs lack standardized systems for identifying and managing frail elderly patients, contributing to care delays and fragmented services (Iozzo et al., 2024). Not only is this gap actionable and measurable, but it also allows healthcare administrators to commit to improving patient outcomes, reducing age-related health disparities, and aligning operations with quality benchmarks.

Purpose of the Integrative Review

According to Whitemore and Knafl (2005), an integrative review summarizes the empirical and theoretical literature to offer a more comprehensive understanding of a particular phenomenon or healthcare problem. Building upon this approach, the purpose of this integrative review is threefold: (1) to evaluate the current body of literature on systemic, clinical, and operational contributors to prolonged emergency department (ED) length of stay (LOS) for elderly patients in acute hospital settings; (2) to identify evidence-based strategies that optimize ED throughput and quality of care for elderly adults; and (3) to inform healthcare administrators about practical interventions that can reduce mortality and improve coordination of care. This review seeks to bridge the gap between current performance and the ideal state of operations by synthesizing quantitative and qualitative research findings, examining theoretical frameworks, and identifying best practices to improve efficiency and outcomes. Additionally, the review addresses social determinants of health, such as frailty, access to primary care, and socioeconomic vulnerability, that exacerbate the risks elderly patients face during prolonged ED stays. Through this evidence-based synthesis, the review aims to drive positive social change by equipping healthcare leaders with actionable insights to enhance emergency care delivery for aging populations.

Integrative Review Question(s)

How can hospitals identify evidence-based strategies to optimize length of stay and quality of care for elderly patients, in alignment with the recommended 4-hour benchmark in acute hospital settings?

Theoretical and/or Conceptual Framework

This integrative review is guided by two complementary frameworks:

Donabedian's structure–process–outcome (SPO) model and general system theory (GST). Donabedian's model, first introduced in 1966 and later expanded (Donabedian, 2005), provides a foundational framework for evaluating the quality of healthcare services. The model breaks down healthcare quality into three key components: structure, which refers to the physical and organizational settings in which care is delivered; process, which encompasses the actual delivery of care; and outcome, which focuses on the results of care, including patient satisfaction, health improvements, or mortality rates. Within the context of this review, structure refers to the emergency department (ED) environment, including staffing, bed capacity, and available protocols, while process encompasses the coordination, timeliness, and appropriateness of geriatric care. Outcomes are measured by metrics such as length of stay (LOS), mortality, and functional decline in elderly patients. The SPO model is widely recognized by quality-monitoring agencies such as the Centers for Medicare & Medicaid Services (CMS) and supports data-driven strategies to improve care delivery and patient safety.

General system theory, initially developed by Ludwig von Bertalanffy (1968), adds depth by conceptualizing the emergency department as a dynamic, interdependent subsystem within the larger hospital system. GST posits that healthcare organizations comprise multiple interconnected components, inputs, processes, outputs, and feedback loops that must function harmoniously for optimal performance. When one component, such as bed availability or discharge efficiency, becomes dysfunctional, it disrupts the

entire system. Applying GST to this review highlights how delays in ED throughput are not isolated issues but rather symptomatic of systemic inefficiencies in communication, coordination, and resource allocation. Together, Donabedian's model and GST provide a robust dual-lens framework for examining how structural limitations and process breakdowns contribute to prolonged ED LOS and poor outcomes among elderly patients. These frameworks help identify not only what is failing in care delivery but also where and why, enabling healthcare leaders to implement system-level reforms that improve performance and reduce disparities for vulnerable populations.

Part 2: Literature Review, Quality Appraisal, and Analysis

Literature Search Strategy

To ensure a thorough, evidence-based foundation for this integrative review, the research was conducted through a structured literature review of publications from 2021 to 2025. The search focused specifically on elderly patients aged 65 and older who experienced prolonged emergency department (ED) length of stay (LOS) and its associated impact on quality of care, clinical outcomes, and patient boarding. This timeframe was selected to capture the most current post-pandemic trends, such as ED operational challenges, staffing shortages, and boarding escalated nationally following COVID-19.

A combination of healthcare, medical, and multidisciplinary databases was searched, including MEDLINE, CINAHL, ScienceDirect, Scopus, AHRQ, and Google Scholar, to ensure broad coverage and reduce publication bias. Boolean operators were applied to a combination of terms, including *emergency department*, *elderly patients*, *older adults*, *time-to-treatment*, *wait times*, *ED boarding*, *quality of care*, and *length of stay*. Research further refined the search within each database using subject terms such as *frail elderly*, *emergency service hospital*, *time factors*, and *triage* to narrow results to studies focused on hospital-based performance rather than generalized emergency medicine. Synonyms and related terms such as *geriatric*, *older adults*, *senior patients*,

and *frail elderly* were also incorporated to ensure comprehensive retrieval of literature across indexing variations.

Forward and backward reference searches were also used to identify additional relevant studies not initially captured by the databases' queries. This was particularly useful for locating AHRQ and policy-based resources describing system-level approaches to boarding reduction. Inclusion and exclusion criteria were then applied to select the final articles, limiting the review to peer-reviewed studies conducted in acute hospital settings with patient populations aged 65 and older. Studies published before 2021 or those focusing on patients younger than 65 were excluded. These criteria ensured the final body of literature was clinically relevant and aligned with elderly patient outcomes and ED operational performance.

Table 1
Inclusion and Exclusion Search Criteria

Inclusion search criteria	Exclusion search criteria
<ul style="list-style-type: none"> Elderly patients, 65 years and older. Length of stay (LOS), quality of care, and ED boarding. Published dates between 2021 and 2025. Peer-reviewed articles. 	<ul style="list-style-type: none"> Studies published before 2021. Population under 65 years old. Studies conducted outside of acute hospital settings. Studies that do not focus on ED LOS, quality of care, patient boarding, and patient flow.

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- Quantitative, qualitative, mixed-methods, or systematic and integrative reviews that evaluate evidence-based strategies, interventions, and outcomes.

Quality Appraisal

A total of 142 articles were initially identified across all databases, and after duplicate removal and full screening, 12 articles published between 2021-2025 were retained for quality appraisal. The Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) appraisal tool was used to evaluate the methodological rigor, strength of evidence, and overall quality of each study. This tool was selected because it supports the appraisal of both research and non-research evidence and aligns with administrative decision-making in healthcare settings. The appraised studies represented a range of evidence levels, including observational quantitative designs, mixed-method studies, predictive modeling, and systematic or integrative reviews. All retained articles focused on elderly adults aged 65 years and older in acute hospital emergency department settings, ensuring relevance to the practice-based problem of prolonged ED length of stay (LOS). No outpatient, long-term care, or community-based studies were included, as the purpose of this review is specifically tied to hospital throughput, clinical readiness, and emergency department operations.

The studies were also evaluated for alignment with the theoretical foundations of this review: Donabedian's structure-process-outcome (SPO) model and general systems theory. Articles that examined system-level contributors, such as boarding time, patient inflow/outflow constraints, staffing, triage prioritization, and quality-of-care outcomes, were rated as highly relevant. These frameworks guided appraisal by distinguishing between structural barriers, process inefficiencies, and outcome measures.

Using the JHNEBP criteria, most studies were rated as high quality due to clearly defined methods, valid outcome measures, and applicability to geriatric emergency care. A smaller portion was rated as good quality, typically due to limited sample size or partial generalizability, but was retained for its contextual relevance to throughput and LOS improvements. Overall, the quality of the retained evidence strongly supports the review question and provides a sound empirical foundation for analyzing contributing factors to prolonged ED LOS among elderly patients. A detailed breakdown of each study's evidence level, quality rating, population characteristics, and outcome measures is presented in Appendix C.

Thematic Analysis of Literature

The thematic analysis was conducted by reviewing and coding key findings from each of the 12 appraised studies to identify recurrent concepts related to factors influencing emergency department length of stay for elderly patients. Initial codes were extracted directly from the literature and represented distinct solution-focused strategies, including triage redesign, capacity optimization, predictive technology integration, discharge coordination, and geriatric-centered interventions. These initial codes were

then clustered into subthemes based on conceptual similarity and operational relevance to emergency department functioning and further synthesized into four overarching themes: capacity and throughput optimization, workflow and care coordination redesign, geriatric-centered emergency care models, and safety, transitions, and outcome optimization. The progression from raw codes to final synthesized themes demonstrates rigorous integration of evidence and is fully reflected in Appendix D through the DHA Thematic Analysis Matrix.

In addition, the evidence base underlying these themes was largely derived from real-world hospital performance studies, including retrospective analyses, cross-sectional observational research, integrative and umbrella reviews, predictive analytics models, and quality improvement evaluations. These study designs were well-suited to illuminate system-level contributors to prolonged ED length of stay and to provide actionable insights into operational interventions rather than isolated clinical outcomes. Although reliance on secondary data or single-site analyses may limit generalizability, the consistency of findings across diverse methodologies reinforced thematic convergence and supported the interpretation that reducing ED LOS for elderly patients requires coordinated changes to both system structure and care-delivery processes.

Table 2
Themes and Subthemes

Themes	Subthemes
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Capacity and Throughput Optimization	ED boarding reduction strategies Process bottleneck reduction Workforce and capacity readiness
Workflow and Care Coordination Redesign	Technology-enabled triage and predictive tools Rapid assessment and escalation pathways Workflow and resource optimization
Geriatric-Centered Emergency Care Models	Frailty and functional risk identification Geriatric-sensitive triage models Workforce training and geriatric care readiness
Safety, Transitions, and Outcome Optimization	Discharge planning and care transitions Preventable harm and patient safety Reduced admission and deterioration

Figure 1
Integrative Review Themes and Subthemes

Themes and Subthemes	Relationship to Theory
Capacity and Throughput Optimization <ul style="list-style-type: none"> • ED boarding reduction strategies • Process bottleneck reduction • Workforce and capacity readiness 	Donabedian's model's structure component aligns with this theme by strengthening organizational capacity and infrastructure needed for timely emergency care. It also reflects General Systems Theory by illustrating how targeted structural interventions recalibrate the interdependent components of the system to relieve congestion and stabilize patient flow.
Workforce and Care Coordination Redesign	The process and outcome dimensions of Donabedian's model align with this theme by redesigning clinical workflows

<ul style="list-style-type: none"> • Interprofessional communication and handoff optimization • Geriatric-sensitive triage models • Workforce training and geriatric care readiness 	<p>to support timeliness, coordination, and responsiveness. It reflects General Systems Theory as improving care processes creates systemic feedback loops that reduce bottlenecks and enhance inter-unit coordination.</p>
<p>Geriatric-Centered Emergency Care Models</p> <ul style="list-style-type: none"> • Technology-enabled triage and predictive tools • Rapid assessment and escalation pathways • Geriatric ED protocols and care bundles 	<p>This domain aligns with both the process and outcome dimensions of Donabedian’s model, adapting triage and care practices to the clinical needs of older adults, thereby preventing deterioration. It reflects General Systems Theory by showing how system responsiveness improves when high-risk populations are explicitly integrated into care design rather than accommodated reactively.</p>
<p>Safety, Transitions, and Outcome Optimization</p> <ul style="list-style-type: none"> • Discharge planning and care transitions • Preventable harm and patient safety • Reduced Readmissions and deterioration 	<p>The outcome dimension of Donabedian’s model aligns with this theme by emphasizing downstream effects of ED care on recovery, safety, and independence. It reflects General Systems Theory by framing improved outcomes as feedback mechanisms that reinforce system stability and drive continuous performance improvement.</p>

Part 3: Presentation of Results

The four themes represent interconnected domains that collectively explain the factors contributing to prolonged ED LOS among older adults and the multilevel strategies most effective for reducing it. Capacity and throughput optimization captures the structural conditions that shape system performance, while workforce and care coordination redesign reflect the care processes that influence decision-making, timeliness, and interprofessional alignment. Geriatric-centered emergency care models address clinical pathways tailored to the unique physiological and functional needs of older adults, and safety, transitions, and outcome optimization focuses on the downstream

effects of ED care, including discharge readiness, preventable harm, and post-ED deterioration.

Each theme is operationalized by subthemes that illustrate how specific strategies function within the broader domain, for example, boarding reduction and bottleneck mitigation within capacity optimization, or technology-enabled triage and rapid escalation within geriatric-centered models. Together, the themes demonstrate a sequential and reinforcing relationship: structural capacity influences care processes, which, in turn, shape geriatric-specific clinical interventions, which ultimately determine safety and patient outcomes.

This integrated thematic structure directly addresses the review question by showing how system-level, process-level, and patient-level strategies collectively reduce LOS and improve quality of care for older adults. Overall, the four themes demonstrate that prolonged ED LOS results from interactions among structural, process, and outcome-level factors, and that meaningful improvement requires coordinated efforts across capacity management, workflow redesign, geriatric-focused practices, and safe care transitions.

Interpretation of the Findings

Theme 1: Capacity and Throughput Optimization

The findings across the reviewed studies consistently reinforce that emergency department (ED) overcrowding and throughput inefficiencies are significant determinants of prolonged length of stay (LOS) among elderly patients. This theme synthesizes system-level structural barriers and optimization strategies that influence patient flow,

resource allocation, and timeliness of geriatric emergency care. Moreover, the results confirm long-standing concerns in the literature (Sartini et al., 2022) while extending knowledge through emerging innovations such as AI-enabled flow tools and macro-level coordination models (Ahmadzadeh et al., 2025; Samadbeik et al., 2024). Each subtheme captures a specific mechanism through which LOS is affected and improved.

Subtheme: ED Boarding Reduction Strategies

Multiple studies underscore ED boarding as one of the strongest predictors of prolonged LOS, especially for older adults requiring complex care. Ehrlich et al. (2023) identified boarding as a central cause of delayed treatment, emphasizing that bed shortages and downstream bottlenecks compromise both safety and care quality. This aligns with the AHRQ (2025) report, which classifies ED boarding as a “national crisis” and stresses adherence to the 4-hour boarding benchmark, improved inpatient discharge processes, and standardized transfer pathways as essential mitigation steps.

Sartini et al. (2022) expand on this by noting that both micro-level strategies, such as fast-track units and rapid triage, and macro-level solutions, such as hospital-wide bed management protocols, are necessary to sustainably decompress ED volume. Their focus on predictive surge analytics and proactive inpatient coordination further confirms that boarding solutions require structural reengineering rather than isolated ED interventions. Collectively, the literature confirms that ED boarding reduction is foundational to restoring throughput, extending prior research by identifying advanced, tech-supported operational strategies absent in earlier pre-pandemic models.

Subtheme: Process Bottleneck Reduction

Process bottlenecks were consistently cited as operational drivers of delays, particularly at key transition points, including triage, diagnostic evaluation, and disposition decision-making. Studies by Mostafa and El-Atawi (2024) and Van Loon-van et al. (2024) highlight that workflow redesign, such as triage optimization, dynamic staffing models, and targeted peak-time interventions, can measurably improve throughput even in persistently crowded EDs. Sartini et al. (2022) describe bottlenecks arising from poor discharge coordination and insufficient hospital-wide flow integration, while Samadbeik et al. (2024) emphasize the necessity of multi-phase, system-wide redesign that addresses delays both before and after ED care. The findings extend knowledge by reframing bottlenecks as interdependent failures rather than siloed operation issues.

The integration of AI-driven decision-support tools, such as predictive LOS algorithms (Song et al., 2025) and automated resource allocation (Ahmadzadeh et al., 2025), further advances the field by demonstrating that technology can proactively identify and mitigate bottlenecks before they escalate into prolonged LOS.

Subtheme: Workforce and Capacity Readiness

Several studies reveal that staffing patterns, personnel readiness, and skill mix significantly influence ED capacity and LOS for older adults. Ehrlich et al. (2023) and Savioli et al. (2024) highlight that older adults often require more intensive assessment and monitoring, underscoring the need for adequate staffing to prevent delays. Workforce

readiness becomes especially critical in implementing fast-track models, rapid assessment protocols, and geriatric-sensitive triage processes.

Mostafa and El-Atawi (2024) identify dynamic staffing models and performance measurement tools as key enhancers of ED capacity, while Van Loon-van et al. (2024) found that adding float staff at peak hours improved throughput even without structural expansions. The results validate that workforce preparedness functions serve as both a structural and procedural driver of length of stay (LOS). Additionally, emerging tools such as staffing-support algorithms and predictive triage systems (Ahmadzadeh et al., 2025; Song et al., 2025) extend current knowledge by demonstrating how technology can augment workforce capacity and reduce delays associated with human-resource constraints.

Overall, the theme confirms well-known challenges in ED overcrowding while extending the discipline with evidence-based innovations that include AI, predictive flow redesign, dynamic staffing, and multi-level bottleneck mitigation strategies. Across all subthemes, the findings reinforce the notion that prolonged LOS among elderly patients results from compounded structural and process failures, consistent with the mechanisms outlined in Donabedian's SPO model and GST.

Theme 2: Workforce and Care Coordination Redesign

The findings across the reviewed literature clearly demonstrate that the way clinical teams communicate, coordinate, and assess older adults in the ED significantly shapes both timeliness and quality of care. This theme captures key process-level factors

influencing LOS, reflecting Donabedian's process construct and GST's emphasis on interaction, feedback, and subsystem coordination. The results confirm existing evidence on geriatric vulnerability in the ED while extending current knowledge through emerging strategies involving structured communication, specialized triage models, and enhanced workforce preparation.

Subtheme: Interprofessional Communication and Handoff Optimization

Several studies have highlighted communication breakdowns as a major contributor to delays in the care of elderly patients. Samadbeik et al. (2024) emphasized that ED performance improves when care teams, including ED physicians, nurses, case managers, and inpatient services, engage in structured communication practices that reduce decision-making delays and prevent duplicated assessments. Their umbrella review noted that ineffective handoffs lengthen LOS by prolonging diagnostic clarification, bed assignment, and treatment planning.

The AHRQ (2025) report similarly found that hospitals with standardized inpatient-ED communication frameworks, such as early discharge huddles, bed-readiness notifications, and multidisciplinary rounds, experience more efficient flow and fewer bottlenecks. Moreover, the findings reinforce existing literature by showing that misaligned communication extends LOS. However, they extend prior knowledge by offering specific post-pandemic coordination strategies that address surges and staffing instability. Under Donabedian's model, interprofessional communication reflects process quality, the mechanisms through which care is delivered. Under GST, improved

communication strengthens linkages between subsystems, stabilizes the entire care continuum, and reduces upstream delays in the ED.

Subtheme: Geriatric-Sensitive Triage Models

Older adults present unique challenges due to atypical symptoms, multimorbidity, frailty, and cognitive changes. Evidence strongly supports the need for geriatric-specific triage protocols. Savioli et al. (2024) found substantial over- and under-triage rates in older adults when traditional triage tools were used, demonstrating a mismatch between existing models and geriatric needs. Their findings confirm earlier work by Davis and Evans (2021), who argued that triage processes must incorporate frailty markers, functional assessments, and geriatric-specific risk factors.

This theme also extends knowledge by identifying innovative tools, such as AI-assisted risk scoring (Ahmadzadeh et al., 2025; Song et al., 2025), that improve early identification of high-risk elderly patients and reduce delays in diagnostic or treatment pathways. Studies indicated that geriatric-sensitive triage not only improves accuracy but also accelerates downstream decision-making and resource allocation, directly mitigating prolonged LOS. In Donabedian's framework, triage is a process-level intervention that shapes the quality and timeliness of clinical decision-making. Within GST, enhanced triage models demonstrate how improving one component, early risk detection, produces system-wide benefits, reducing workloads, preventing unnecessary inpatient transfers, and stabilizing care processes.

Subtheme: Workforce Training and Geriatric Care Readiness

Findings consistently show that preparedness, including familiarity with geriatric syndromes, communication techniques, and frailty assessment, significantly influences ED performance for older adults. Ehrlich et al. (2023) emphasized that during overcrowding, older adults are disproportionately disadvantaged unless clinicians are trained to recognize atypical presentations. Workforce readiness affects both timeliness and safety, particularly for older adults who may deteriorate quickly without early intervention.

Van Loon-van et al. (2024) demonstrated that implementing structured staff training and assigning personnel specifically to high-risk elderly patients improved throughput and reduced treatment delays. Davis and Evans (2021) further confirmed that targeted workforce education, especially in triage and early assessment, can mitigate common missteps such as undertriage, delayed imaging, or missed escalation opportunities.

The subtheme extends prior literature by showing how post-pandemic staffing fluctuations and expanded staff roles, such as geriatric-trained nurses or ED care coordinators, influence timely care. Staffing readiness also relates directly to Donabedian's structural and process elements, since trained personnel represent both a structural resource and a mechanism for delivering care. GST reinforces that workforce readiness is a key subsystem property, when staff are prepared to manage geriatric needs, delays decrease, throughput improves, and care pathways become more predictable and stable.

In conclusion, the theme of workforce and care coordination redesign confirms longstanding concerns regarding geriatric mis-triage, care fragmentation, and communication gaps while extending knowledge through emerging strategies such as enhanced triage tools, formalized communication workflows, and targeted geriatric training. Across all subthemes, the findings illustrate that optimizing geriatric ED care requires coordinated processes and a well-prepared clinical workforce, both central pillars of Donabedian's process framework and GST's systems-based perspective on interdependence and feedback loops.

Theme 3: Geriatric-Centered Emergency Care Models

This theme reflects evidence-based clinical models explicitly designed to improve emergency care for older adults. Across the reviewed studies, there is a strong consensus that standard ED workflows are insufficient for the unique physiological, cognitive, and functional needs of geriatric patients. These findings confirm longstanding concerns in the literature about the mismatch between traditional ED designs and the needs of older adults, while extending current knowledge through the emergence of technology-driven risk-stratification tools and geriatric-tailored care bundles. All three subthemes align strongly with Donabedian's process and outcome domains and demonstrate, through GST, how geriatric-focused interventions enhance system responsiveness and reduce LOS.

Subtheme: Technology-Enabled Triage and Predictive Tools

Several included studies emphasized the growing role of technology, particularly artificial intelligence (AI), machine learning, and predictive analytics, in supporting

decision-making for geriatric patients. Ahmadzadeh et al. (2025) demonstrated that AI-based triage solutions significantly reduce wait times by improving the accuracy of early risk identification and predicting ED demand surges. These tools help clinicians identify older adults at high risk for deterioration, facilitating earlier interventions and reducing bottlenecks later in the care process. Similarly, Song et al. (2025) highlighted the utility of interpretable machine learning models in predicting both LOS and patient disposition among adults presenting to the ED. Their findings show that predictive algorithms can support more accurate placement decisions and anticipate resource needs, ultimately improving throughput for elderly patients who otherwise face prolonged delays due to complex clinical presentations. Together, these studies extend traditional geriatric ED literature by showing that predictive technologies are not only feasible but also effective in optimizing early clinical decision-making. Under Donabedian's framework, these tools directly improve care processes, while GST emphasizes how improved forecasting stabilizes the entire ED system by reducing uncertainty and preventing downstream congestion.

Subtheme: Rapid Assessment and Escalation Pathways

The evidence strongly supports the use of structured rapid assessment pathways to accelerate diagnostic and treatment processes for older adults. Van Loon-van et al. (2024) illustrated that implementing coordinated interventions, such as rapid diagnostics, expedited imaging workflows, and streamlined specialist consultation, can improve patient flow and reduce ED congestion. Their quality improvement project demonstrated that implementing multiple rapid-assessment strategies simultaneously results in

measurable reductions in delays, confirming that multifaceted approaches are more effective than isolated interventions. Savioli et al. (2024) further support this subtheme, noting that rapid escalation protocols are particularly valuable for elderly patients who present with subtle or atypical symptoms. Early activation of such pathways reduces the risk of under-triage, prevents deterioration, and shortens LOS.

These findings build upon existing research by emphasizing that timeliness is especially critical in geriatric emergency care. Unlike younger adults, older adults face significantly higher risks of functional decline, delirium, and adverse outcomes when delays occur. Under Donabedian, these pathways represent high-quality processes designed to produce better outcomes; under GST, they illustrate how accelerating one segment of the care continuum relieves strain across the system.

Subtheme: Geriatric ED Protocols & Care Bundles

Evidence from multiple studies reinforces the value of implementing geriatric-specific protocols and bundles that address the unique needs of older adults. Ehrlich et al. (2023) emphasized the importance of prioritizing geriatric patients during high-volume surges and noted that tailored care approaches reduce vulnerability to adverse outcomes associated with overcrowding. Their findings show that structured geriatric care bundles, such as delirium prevention protocols, fall-risk assessments, and mobility preservation strategies, help mitigate the risks associated with prolonged LOS.

Garcia and Hass (2025) further extend this evidence by demonstrating that pre-discharge interventions, transitional planning, and functional assessments are essential for reducing LOS and preventing readmissions among older adults. Their review underscores

the importance of embedding geriatric-focused processes early in the ED encounter to support both safe discharge and efficient throughput.

These studies confirm the long-recognized need for geriatric-sensitive ED models but extend the literature by highlighting post-pandemic care challenges and the growing necessity of age-friendly ED design. Within Donabedian's framework, geriatric protocols shape processes that directly influence patient outcomes, whereas GST views them as mechanisms that improve system stability, enhance predictability, and reduce negative feedback loops associated with prolonged ED stays.

Furthermore, this theme demonstrates that optimizing emergency care for older adults requires integrating geriatric-specific triage tools, rapid assessment pathways, and structured care bundles. These findings confirm well-established challenges associated with traditional ED models and extend the literature by highlighting the promising role of digital decision-support tools and standardized care protocols. Together, these interventions closely align with Donabedian's process and outcome constructs and, through the lens of GST, illustrate how geriatric-centered care models create a more responsive, coordinated, and efficient ED ecosystem.

Theme 4: Safety, Transition, and Outcome Optimization

Theme 4 synthesizes evidence demonstrating how prolonged LOS impacts patient safety, care transitions, and clinical outcomes for older adults. According to the reviewed studies, elderly patients are uniquely vulnerable to deterioration when transitions of care are delayed, and that improving transitions of care is essential to reducing readmissions, preventing harm, and supporting recovery. These findings confirm well-established

concerns about geriatric safety risks in the ED while extending current knowledge by identifying modern discharge planning approaches, transitional care interventions, and system-level strategies that mitigate the downstream effects of prolonged LOS. This theme aligns strongly with Donabedian's outcome domain and demonstrates, through GST, how improved transitions create stabilizing feedback loops that enhance the entire hospital system.

Subtheme: Discharge Planning and Care Transitions

Multiple studies emphasized that well-structured discharge processes significantly improve outcomes for older adults and reduce the negative downstream effects associated with prolonged LOS. Garcia and Hass (2025) highlighted that coordinated pre-discharge interventions, such as medication reconciliation, follow-up scheduling, and functional assessment, help prevent unmet care needs that often lead to return visits and hospital readmissions in the elderly population. Their findings demonstrate that transitional planning functions as both a safety mechanism and a throughput enhancer, as effective transitions free inpatient beds and improve ED flow.

Hirani et al. (2025) similarly identified discharge planning as a critical intervention to reduce LOS and strengthen continuity of post-acute care. Their review found that hospitals implementing structured transition-of-care models see improvements in recovery trajectory, functional independence, and patient safety among older adults. These findings extend current literature by describing the specific transition activities, such as timely referrals, mobility evaluations, and caregiver education, that most effectively address geriatric vulnerabilities.

Under Donabedian's framework, discharge planning reflects an outcome-oriented process that directly determines post-ED safety and stability. From a GST perspective, effective transitions represent a form of "system decompression," where reducing ED and inpatient congestion creates positive feedback loops that enhance overall hospital performance.

Subtheme: Preventable Harm and Patient Safety

Prolonged ED LOS is consistently associated with higher risks of preventable harm, and the findings across the reviewed studies confirm how profoundly older adults are affected by delays. Ehrlich et al. (2023) emphasized that elderly patients experience increased rates of delirium, falls, medication delays, functional decline, and cognitive deterioration when kept in the ED for extended periods. Their work highlights the disproportionate impact of environmental overstimulation, noise, and immobility on geriatric patients, conditions that become unavoidable when ED stays exceed recommended thresholds.

Sartini et al. (2022) additionally illustrated that overcrowding magnifies safety risks by straining staffing resources, reducing monitoring capacity, and lowering adherence to clinical quality indicators. These findings extend previous research by identifying specific mechanisms, such as delayed triage reassessments, slower response times, and fragmented care continuity, that make older adults especially susceptible to harm during prolonged LOS. These safety concerns align directly with Donabedian's outcome dimension, reflecting the ultimate consequences of inadequate structure and process components earlier in the care continuum. Within GST, preventable harm

demonstrates how system strain at one point, ED congestion, produces adverse ripple effects across other subsystems, including inpatient units and post-acute care networks.

Subtheme: Reduce Readmission and Deterioration

The reviewed studies consistently show that hospitals implementing LOS-focused, geriatric-centered interventions see reductions in readmissions and clinical deterioration. Hirani et al. (2025) reported that strategies aimed at decreasing LOS, such as streamlined workflows, early transitional care planning, and coordinated discharge pathways, significantly reduced 30-day readmissions among older adults. Garcia and Hass (2025) similarly found that improving ED-based interventions reduces both return visits and escalations in care level, demonstrating that optimizing LOS not only improves efficiency but also strengthens long-term outcomes.

Ehrlich et al. (2023) reinforced that prolonged ED stays are directly associated with increased mortality risk and functional decline in older adults, confirming that LOS is not merely an operational metric but a clinically meaningful predictor of patient well-being. By illustrating how LOS-reduction efforts improve safety, mobility, cognitive stability, and independence, these findings extend current knowledge by providing clear, actionable pathways linking ED performance to geriatric clinical outcomes. Under Donabedian's model, these results represent the outcome endpoint of well-designed structure and process improvements. From a GST perspective, reductions in readmissions and deterioration create reinforcing loops that ease ED congestion, increase bed turnover, and improve overall system resilience.

In conclusion, theme 4 confirms that prolonged LOS threatens geriatric safety, disrupts transitions, and worsens clinical outcomes. It extends the literature by demonstrating that targeted discharge planning, early transitional care, geriatric-oriented safety bundles, and LOS-focused interventions can reduce preventable harm and improve stability after ED discharge. These findings strongly support Donabedian's outcome framework and, through GST, illustrate how improved transitions enhance system-wide performance and reduce the burden of overcrowding.

Part 4: Recommendation for Professional Practice and Implications for Social Change

Recommendations for Professional Practice

Capacity and Throughput Optimization

Prolonged emergency department (ED) length of stay (LOS) in older adults is primarily driven by systemic barriers, including boarding delays, process bottlenecks, and insufficient inpatient capacity. Studies across the evidence set demonstrate that persistent congestion compromises timeliness, increases the risk of patient deterioration, and impedes clinicians' ability to deliver age-appropriate care (AHRQ, 2025; Sartini et al., 2022). The literature consistently shows that structural barriers at the system level, limited bed mobility, delayed inpatient discharges, and inadequate surge capacity create upstream delays that disproportionately affect elderly patients who are especially vulnerable to deterioration during prolonged ED stays. These findings highlight the need for health systems to implement structural reforms that improve flow and stabilize capacity.

Based on the review findings, hospitals should adopt standardized boarding reduction strategies, including time-based escalation thresholds and proactive inpatient discharge coordination. Real-time bed management dashboards, early discharge prediction tools, and multidisciplinary throughput meetings are supported by studies such as Mostafa and El-Atawi (2024) and Samadbeik et al. (2024), demonstrating improved efficiency when systems use coordinated operational flow models. Workforce and capacity readiness, particularly targeted staffing models and flex teams, also emerged as critical components for supporting throughput during high-volume periods affecting

geriatric arrivals. These practices enable leaders to reduce bottlenecks, shorten LOS, and maintain safety and timeliness for older adults.

These recommendations align with Donabedian's structure component by strengthening system inputs such as staffing, bed availability, and flow infrastructure. Through the lens of GST, optimizing throughput shows how improvements in one subsystem, such as inpatient discharge and resource allocation, generate positive effects across the ED care continuum. Effective structural interventions, therefore, create conditions under which process improvements and geriatric-centered models can function as intended.

Workforce and Care Coordination Redesign

Timely and effective care for older adults depends heavily on coordinated communication, accurate triage, and a ready workforce. Multiple studies highlight that older adults experience atypical presentations, high polypharmacy risk, and complex medical histories, all of which increase their susceptibility to mis-triage or delayed interventions (Davis & Evans, 2021; Savioli et al., 2024). Breakdowns in interprofessional communication and fragmented handoff processes further exacerbate delays that contribute to prolonged LOS. The findings of this review underscore the need for EDs to redesign care coordination workflows to ensure that older adults are identified early, triaged accurately, and managed through interdisciplinary collaboration.

Professional practice guidelines should prioritize implementing geriatric-sensitive triage tools and structured handoff processes. These include frailty screening instruments, early-warning indicators, and standardized communication protocols such as SBAR or

electronic handoff modules. Evidence from Van Loon-van et al. (2024) and other operational studies demonstrates that when teams communicate effectively and use shared decision pathways, delays decrease and ED efficiency improves. Workforce development is also essential; ongoing geriatric education, simulation training, and competency development in recognizing atypical presentations were consistently recommended across the literature.

In addition, the recommendations reflect Donabedian's process dimension by addressing the clinical actions and interactions that shape ED care quality. From the GST perspective, care coordination redesign illustrates how improved communication and shared workflows create reinforcing feedback loops that reduce bottlenecks, improve decision-making, and enhance system responsiveness. Strengthening frontline processes improves both timeliness and safety for older adults.

Geriatric-Centered Emergency Care Models

Older adults require tailored clinical pathways that account for frailty, cognitive vulnerability, and functional limitations. Findings from Davis and Evans (2021) and Savioli et al. (2024) confirm that traditional triage and standard ED workflows fail to adequately identify risk in geriatric patients, resulting in delays that contribute to functional decline. At the same time, emerging literature highlights the growing integration of predictive models, AI-assisted triage tools, and digital decision aids to enhance early risk detection (Ahmadzadeh et al., 2025; Song et al., 2025). These innovations signify an important shift toward geriatric-centered emergency care that prioritizes rapid assessment and escalation.

Professional practice guidelines should include adopting technology-enabled triage tools, geriatric-focused ED protocols, and rapid assessment pathways to streamline interventions for frail or high-risk older adults. Implementing care bundles addressing delirium prevention, mobility safety, sensory support, hydration, and cognitive screening can standardize high-quality geriatric emergency care across departments. These models improve the consistency of care delivery, reduce variation in clinical decision-making, and help ensure that high-risk patients receive prompt and appropriate interventions.

Furthermore, the recommendations align with the process and outcome dimensions of Donabedian's model, as they directly influence timeliness, safety, and clinical outcomes. From a GST standpoint, geriatric-centered care pathways enhance system responsiveness by enabling early detection, quicker stabilization, and improved care transitions. When ED workflows intentionally account for geriatric needs, the entire system benefits through reduced LOS, fewer complications, and improved patient flow.

Safety, Transactions, and Outcome Optimization

The review findings demonstrate that older adults face significantly higher risks of preventable harm, readmission, and clinical deterioration when ED LOS is prolonged. Complications such as delirium, falls, medication delays, and functional decline, highlighted by Ehrlich et al. (2023) and Sartini et al. (2022), underscore the need for enhanced safety practices and coordinated transitions for geriatric patients. Inadequate discharge planning, limited caregiver support, and fragmented outpatient follow-up contribute to poor outcomes and repeat ED visits, demonstrating the importance of strengthening post-ED transitions.

Professional practice recommendations include implementing structured geriatric discharge protocols, early transitional care planning, and follow-up coordination before the patient leaves the ED or inpatient unit. Evidence from Garcia and Hass (2025) and Hirani et al. (2025) supports the use of mobility assessments, medication reviews, appointment scheduling, and caregiver instruction to stabilize patients after discharge. Safety bundles that target delirium prevention, sensory stabilization, hydration, and early mobilization should be integrated into ED workflows to prevent avoidable harm during prolonged stays.

These recommendations align with Donabedian's outcome dimension by focusing on outcomes of care, functional stability, safety, recovery, and reduced readmissions. Under GST, effective care transitions serve as stabilizing mechanisms that reduce strain across the broader health system. When older adults experience safer transitions and fewer complications, ED congestion decreases, inpatient capacity improves, and overall system performance strengthens.

Implications for Social Change

The findings of this integrative review demonstrate that prolonged emergency department (ED) length of stay among older adults is deeply connected to multiple social determinants of health (SDOH), particularly those related to access to care, economic stability, social support, and community resources. As Hatef et al. (2019) describe, the SDOH shape the well-being and health outcomes of individuals by influencing their ability to navigate the healthcare system, maintain functional independence, and engage in timely, appropriate care. For older adults, many of whom live with frailty, mobility

challenges, cognitive vulnerability, and limited social support, these determinants significantly influence how they experience emergency care and how safely they transition out of it.

The themes identified in this review highlight areas where health systems can reduce preventable disparities rooted in the SDOH. Capacity and throughput limitations disproportionately affect older adults who may rely on emergency departments as their primary point of access due to limited availability of primary care, transportation barriers, or delayed care-seeking caused by socioeconomic constraints. Faster throughput and safer flow directly benefit older adults who face financial, functional, and caregiver limitations that heighten the risks associated with prolonged ED stays.

The redesign of the workforce and care coordination also carries important SDOH implications. Effective communication, culturally attuned care, and geriatric-sensitive triage help mitigate disparities related to health literacy, cognitive impairment, and limited caregiver involvement, issues common among older adults navigating complex medical systems. By improving coordination and interprofessional collaboration, hospitals can better support patients whose social and behavioral contexts create added challenges during emergency encounters.

Geriatric-centered emergency care models similarly address SDOH by embedding frailty screening, rapid escalation protocols, and geriatric-specific assessments into routine ED practice. These measures enhance identification of older adults who may have underlying vulnerabilities linked to poverty, housing insecurity, food instability, and limited community support. Early detection of these needs within the ED setting supports

more equitable care planning and reduces the likelihood of deterioration during or after the ED visit.

Finally, optimizing safety, transitions, and outcomes is crucial for advancing health equity. Older adults with limited resources, inadequate caregiver support, or low health literacy are at increased risk for poor outcomes after discharge. Implementing structured transition protocols, including medication reconciliation, caregiver education, follow-up scheduling, and mobility and safety assessments, helps address these disparities by ensuring that vulnerable older adults leave the hospital with the tools needed to remain safe and stable in the community.

Collectively, the implications of this review suggest that improving ED LOS for older adults is not solely an operational priority; it is a social justice imperative. By addressing the structural, process, and outcome-level barriers identified in this review, healthcare leaders can reduce disparities rooted in SDOH and create systems better equipped to serve an aging population with dignity, equity, and safety. These findings can guide future efforts to build geriatric-inclusive emergency care models that advance social change and promote healthier, more supportive environments for older adults across the care continuum.

Limitations

Several limitations should be acknowledged when interpreting the findings of this integrative review. First, the review was restricted to 12 peer-reviewed articles published between 2021 and 2025, allowing inclusion of current post-COVID-19 evidence but potentially excluding foundational studies published prior to this period. Although this

enhances relevance to contemporary emergency department operations, it also narrows the historical context of geriatric emergency care.

Second, the included literature consisted primarily of observational studies, quality improvement evaluations, systematic and narrative reviews, and predictive modeling research, with limited randomized or experimental designs. As a result, many findings describe associations rather than causation, consistent with the evidence base available in operational and systems-level emergency care research. This limits the ability to determine definitive causal pathways linking specific interventions to reduced ED LOS in elderly patients.

Third, the studies varied widely in health system context, population characteristics, and ED resources, including differences in staffing, bed capacity, regional policies, and geriatric care infrastructure. While this enhances the breadth of perspectives represented, it may limit generalizability to certain acute care hospitals, including smaller facilities or those without dedicated geriatric ED services.

Fourth, some studies relied on secondary administrative data, which may have incomplete information on social determinants of health, functional status, caregiver support, or community factors that influence LOS in older adults. Similarly, several studies only reported ED outcomes without thoroughly examining downstream effects, such as inpatient length of stay, post-discharge deterioration, or readmissions.

Finally, limitations inherent to the integrative review method must be considered. Although rigorous screening and appraisal procedures were used, the synthesis is still dependent on the quality, transparency, and methodological diversity of the included

studies. The interpretation of themes and subthemes is also subject to researcher judgment, although Donabedian's Structure-Process-Outcome framework and General Systems Theory were used to reduce bias and enhance analytic consistency. Despite these limitations, the findings offer a meaningful and credible synthesis of current evidence and provide a strong foundation for improving emergency department care for older adults experiencing prolonged length of stay.

Conclusion

This integrative review is grounded in a simple but powerful belief: older adults deserve timely, safe, and dignified emergency care, and healthcare systems have both the responsibility and the capacity to deliver it. The synthesis of 12 contemporary studies reveals a clear and actionable message: reducing ED LOS for elderly patients requires a coordinated strategy that strengthens capacity, redesigns care processes, embeds geriatric-centered clinical models, and ensures safe transitions throughout the continuum of care. When these domains operate together, the system becomes more efficient, more responsive, and better aligned with the unique clinical needs of aging populations.

Across the four themes, the findings consistently demonstrate that system capacity and throughput form the structural foundation upon which timely care depends; a trained and coordinated workforce is essential for accurate triage and clinical decision-making; geriatric-specific care models enhance early risk identification and prevent deterioration; and robust transition practices reduce preventable harm and downstream utilization. Viewed through Donabedian's structure-process-outcome lens and general systems theory, the evidence makes clear that meaningful improvement occurs not

through isolated fixes, but through acknowledging and strengthening the interdependent relationships that shape emergency care performance.

Ultimately, the central message of this review is that improving LOS for older adults is both achievable and urgently necessary. By adopting the evidence-based strategies identified in this synthesis, healthcare leaders can build emergency departments that are safer, more efficient, and more equitable for one of the most vulnerable patient populations. Advancing geriatric-focused emergency care is not merely an operational priority; it is a pathway to higher quality, reduced harm, and improved outcomes for older adults across the health system.

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Appendix A: DHA Practice-Based Problem Literature Review Matrix

Author/ date	Theoretical/ conceptual framework	Research question(s)/ hypotheses	Methodology	Analysis & results	Conclusions	Implications for future research	Implications for practice	Empirical research? (Yes or No)
Choi, W., Woo, S. H., Kim, D. H., Lee, J. Y., Lee, W. J., Jeong, S., Cha, K., Youn, C. S., & Park, S. (2021).	The study focuses on emergency department operations and geriatric care.	Does prolonged length of stay (LOS) in the emergency department increase mortality in critically ill elderly patients with infections?	Retrospective multicenter cohort study.	Among 439 elderly patients admitted to the ICU through the ED, those with ED LOS 24 hours or greater had a significantly higher 30-day mortality than those with a shorter LOS.	Prolonged ED LOS in critically ill elderly patients with infection is associated with increased mortality. Timely transfer and interventions are essential to improve outcomes.	Healthcare leaders should explore specific interventions or system-level improvements to reduce ED LOS and their effect on elderly patient outcomes.	Healthcare administrators should adopt methods that help improve triage, staffing, bed management, and care coordination to enhance patient care. This will help address the healthcare administration problem involving operational efficiency, patient safety, and quality outcomes.	Yes

Jones, S., Moulton, C., Swift, S., Molyneux, P., Black, S., Mason, N., Oakley, R., & Mann, C. (2022).	The study is grounded in health services and outcome research that focuses on emergency department throughput and inpatient transitions.	What is the increased risk of mortality associated with delays to inpatient admission from ED?	Cross-sectional retrospective observational study.	The study analyzed over 7.4 million ED admissions ranging from 2016 to 2018, with findings that show delays beyond 5 hours were significantly associated with increased 30-day mortality.	The study shows that delays in admission from the ED beyond 5 hours pose a significant risk to patient safety, contributing to increased mortality. Reducing time to inpatient transfer is critical for improving patient outcomes and minimizing preventable deaths.	Further research is needed to identify the cause of admission delays and evaluate system-level interventions to mitigate prolonged ED stays.	The study clearly identifies the healthcare administration problem as delayed ED to inpatient transitions. Healthcare administrators should adopt operational strategies such as patient flow optimization and resource allocation to improve timely admissions.	Yes
Bronk, K. (2023, November 28)	The study is guided by quality and safety principles with a focus on clinician and patient experiences.	What are the perceived impacts of ED boarding on patient care quality and system-level functioning?	Cross-sectional survey and qualitative focus groups	A survey A focus group with 39 participants, comprising 94, revealed strong consensus that ED boarding	ED boarding is a growing healthcare administration problem that compromises the safety, quality, and timeliness of	Future studies should evaluate the effectiveness of standard boarding protocols, improve	Healthcare administrators should address ED boarding as a patient safety crisis. Their interventions should	No

				contributes to increased patient safety, delayed care, burnout, and breakdown in communication and resources.	care. It also contributes to systemic inefficiencies, requiring urgent operational reform.	resource planning, and implement systemic interventions on care quality and clinician retention.	include standardized boarding care processes, improved communication, and proactive bed and resource management.	
Burgess, L., Ray-Barruel, G., & Kynoch, K. (2021)	Guided by Joanna Briggs' methods.	What associations exist between emergency department (ED) length of stay and patient outcomes, including mortality, inpatient length of stay, time-to-treatment, and adverse events?	Systematic Review of 34 empirical studies	Findings indicated varied associations between ED LOS and patient outcomes, with evidence suggesting that older adults experience longer ED stays and are at increased risk for higher mortality and prolonged inpatient	Data gathered from the study indicate that a substantial professional gap exists in the management of ED duration of stay, particularly among the elderly population. ED boarding and extended stay contribute to adverse outcomes, requiring	Future research is needed to identify specific subsets and effective, tailored interventions that minimize ED LOS and improve outcomes within a hospital setting for elderly patients.	Healthcare administrators should develop strategies to reduce ED LOS and improve care transitions for elderly patients. The ideal state of operations should include shorter ED stays, timely treatment, and reduced boarding.	Yes

				length of stay (IPOS).	targeted initiatives to enhance treatment delivery and optimize patient flow.			
Donabedian A. (2005)	Structure-Process-Outcome Model	The paper conceptually explores how medical quality care can be systematically evaluated and improve through the SPO model.	N/A	The model offers the researcher a lens of understanding how delays in ED processes, such as LOS and boarding, caused by structural inefficiencies, can lead to adverse patient outcomes like increased mortality.	Improving healthcare quality involves evaluating the links between structure, process, and outcomes. The model provides a framework for identifying gaps and designing interventions at each level.	As far as future research, the SPO model is relevant for guiding research aimed at measuring the impact of structural and process improvements on patient outcomes across various healthcare settings.	Healthcare administrator can use the SPO model to analyze and address the caused of prolonged ED LOS.	No

Appendix B: DHA Review Question(s) Search Log

Database or location name	Search terms	Results	Notes
Medline	(emergency department or ER or ED or emergency room) AND (Elderly patients or older adults or geriatrics or senior) AND (Wait times or time-to-treatment or waiting times or boarding time) Refine: Utilize subject terms such as emergency service, frail elderly, and time-to-treatment.	Initial: 84 Refined: 25 Selected: 8	Filters included peer-reviewed journals, date range 2021-2025. The initial search yielded 84 articles, and a refined search using subject terms of emergency service, frail elderly, and time-to-treatment narrowed it down to 25 articles. From these, I selected 8 articles that focus on solutions and best practices for LOS within a 4-hour benchmark.
CINAHL	(emergency department or ER or ED or emergency room) AND (Elderly patients or older adults or geriatrics or senior) AND (Wait times or time-to-treatment or	Initial: 12 Refined: 9 Selected: 3	Duplicates removed. Retained 3 articles focused on reducing LOS and improving quality of care.

Database or location name	Search terms	Results	Notes
	waiting times or boarding time) Refine: Utilize subject terms such as length of stay, time factors, triage, and emergency services.		
ScienceDirect	(emergency department or ER or ED or emergency room) AND (Elderly patients or older adults or geriatrics or senior) AND (Wait times or time-to-treatment or waiting times or boarding time) Refine: ED Length of stay, AI triage or machine learning, and geriatric.	Initial: 12 Refined: 4 Selected: 1	During this search, I started out with 12, and after screening for subject terms like emergency department, artificial intelligence, and triage. Selected 1 high-quality modeling study useful for practice recommendations.
AHRQ (Agency for Healthcare Research and Quality)	“Hospital boarding” AND “ED throughput” AND “older adults”	2 articles selected for review	Government agency resources that focus on boarding reduction strategies and systemic ED performance

Database or location name	Search terms	Results	Notes
			improvement for elderly patients.
Scopus	(emergency department or ER or ED or emergency room) AND (Elderly patients or older adults or geriatrics or senior) AND (Wait times or time-to-treatment or waiting times or boarding time)	Initial: 7 Selected: 3	Reviewed abstracts and retained 3 articles directly related to LOS and quality improvement.
Google Scholar	(Evidence-based strategies, ED LOS, Elderly patients, Quality of Care)	Initial: 25 Selected: 2	Retained two national guidelines/policy reports to support evidence-based practice implementation.

Appendix C: DHA Appraisal Results Log

Author, date, and title	Evidence level and quality rating	Focus: HSO type, research domain, and specific problem being addressed	Findings that help answer the review question(s)	Metrics and measures if used	Source limitations
Ehrlich, A., Erickson, M., Oh, E.S., James, T. & Saxena, S. (2023). Prioritizing care of older adults in times of emergency department overcrowding.	Level IV/High	Acute Hospital Quality Improvement The specific problem addresses the disproportionate impact of ED overcrowding on older adults, who are at risk for delayed care, adverse outcomes, and poor triage prioritization.	The findings highlight that older adults often experience delayed or inadequate care in overcrowded EDs, which increases their risk of adverse outcomes. The authors advocate for integrating frailty assessments into triage processes and prioritizing geriatric patients during periods of high ED volume.	The metrics are discussed conceptually, such as how overcrowding increases LOS or how geriatric patients have higher mortality rates. However, no formal metrics or measures were reported, as the article presents expert observations and insights.	Limitations include the absence of direct evidence, constraints on generalizability, and potential author bias resulting from reliance on expert opinion.
Agency for Healthcare Research and Quality. (2025). AHRQ report identifies strategies to reduce emergency department boarding.	Level IV/High	Acute Hospital Quality Improvement The specific problem that is being addressed is the systemic challenge of emergency department (ED) boarding, specifically exploring strategies that hospitals and health systems can adopt to reduce prolonged ED stays and improve patient throughput.	The AHRQ report identifies multiple evidence-based strategies, such as inpatient bed management, that directly address the reduction of emergency department (ED) boarding.	The article references system-level performance indicators and operational benchmarks. Some include emergency department length of stay, boarding time, and patient flow indicators.	Limitations include a lack of original data, generalized recommendations, and limited methodological transparency.

Author, date, and title	Evidence level and quality rating	Focus: HSO type, research domain, and specific problem being addressed	Findings that help answer the review question(s)	Metrics and measures if used	Source limitations
Ahmadzadeh, B., Patey, Dr. C., Norman, P., Farrell, A., Knight, J., Czarnuch, S., & Asghari, Dr. S. (2025). Artificial Intelligence Solutions to Improve Emergency Department Wait Times: Living Systematic Review.	Level III/High	Acute Hospital Quality Improvement The specific problem being addressed is the challenge of prolonged ED wait times due to overcrowding and inefficient flow.	The systematic review included over 100 AI interventions evaluated across multiple studies focused on the ED setting. The AI solutions, like triage algorithms, predictive models, and resource allocation tools, demonstrated measurable improvements in reducing emergency department length of stay (LOS) and wait times.	Emergency Department Length of Stay (ED LOS) ED Wait Time Resource Utilization Rates	Generalizability Lack of Standardized Metrics Limited report on implementation outcomes
Song, L., Aickelin, U., Fazio, T. N., Sharma, A., Kouhounestani, M., Plumb, S., & Putland, M. J. (2025). Developing interpretable machine learning models to predict length of stay and disposition decision for adult patients in emergency departments.	Level III/High	Acute Hospital Quality Improvement The problem being addressed is the difficulty in accurately and timely predicting the patient's length of stay (LOS) and disposition decision in the ED.	The interpretable machine learning models in the study, built on 21 clinical features, demonstrated strong predictive performance for both emergency length of stay and disposition decisions, which can impact the quality of care for patients.	Clinical Features (21 variables) Model validation techniques Accuracy (ternary classification)	The study was conducted in a single hospital, which limits its generalizability. Some relevant factors were not included in the study, such as social determinants and unrecorded comorbidities.

Author, date, and title	Evidence level and quality rating	Focus: HSO type, research domain, and specific problem being addressed	Findings that help answer the review question(s)	Metrics and measures if used	Source limitations
Hirani, R., Podder, D., Stala, O., Mohebpour, R., Tiwari, R. K., & Etienne, M. (2025). Strategies to Reduce Hospital Length of Stay: Evidence and Challenges.	Level III/High	Acute Hospital Setting Quality Improvement The specific problem addressed is the challenge of prolonged hospital length of stay (HLOS).	The review synthesizes evidence showing that interventions such as structured discharge planning, multidisciplinary care teams, and enhanced recovery after surgery (ERAS) protocols reduce HLOS.	Hospital Length of Stay in days and hours Readmission rates Mortality rates Healthcare-associated infection rates Predictive model accuracy measures	Can have bias. Narrative review, which lacks a defined search methodology. Lacks real-world settings.
Garcia, E., & Hass, Z. J. (2025). Characterizing pre-discharge interventions to reduce length of stay for older adults: A scoping review.	Level V/High	Acute Care Hospital Quality Improvement The study addresses the challenge of prolonged hospital length of stay (LOS) among older adults, focusing on pre-discharge interventions that can safely shorten LOS for elderly patients.	The scoping identifies eight categories of pre-discharge interventions that include staffing enhancement, clinical management, structured discharge protocols, risk assessment tools, nutrition planning, and communication improvements that can potentially reduce LOS among older adults.	Resource utilization metric Timing to discharge Delay intervals Intervention adherence rates Hospital length of stay	Lacks formal methodological rigor. Lacks diversity of intervention types.
Savioli, G., Ceresa, I., Bressan, M., Gaia Bavestrello Piccini, Novelli, V., Cutti, S., Ricevuti, G., Esposito, C., Longhitano, Y., Piccioni, A., Zoubir Boudi, Venturi, A.,	Level III/High	Acute Care Hospital Quality Improvement The study investigates how different triage systems, specifically 4-level vs. 5-level, impact wait times, including under-triage and over-triage, of elderly	The study demonstrates that shifting from a 4-level to a 5-level triage system reduces wait times, improves triage accuracy, and enhances emergency care flow, particularly for geriatric patients.	Under-triage and over-triage rates ED length of stay Wait time Triage accuracy	Retrospective design- limit control over variables Single center study

Author, date, and title	Evidence level and quality rating	Focus: HSO type, research domain, and specific problem being addressed	Findings that help answer the review question(s)	Metrics and measures if used	Source limitations
Damiano Fuschi, Voza, A., Leo, R., Abdelouahab Bellou, & Enrico Oddone. (2024). Geriatric Population Triage: The Risk of Real-Life Over- and Under-Triage in an Overcrowded ED: 4- and 5-Level Triage Systems Compared: The CREONTE		patients in an overcrowded emergency department.			
Davis, P & Evans, D. (2021). The Undertriage of Older Adults in the Emergency Department: A Review of Interventions.	Level V/High	Acute Care Hospital Quality Improvement The study explores the undertriage of older adults in the ED, which significantly contributes to delayed care, adverse outcomes, and missed opportunities for timely intervention.	The article supports my EBP question by presenting evidence-based interventions that improve triage accuracy and reduce ED length of stay through better risk identification.	Triage accuracy 30-day mortality ED LOS Resource utilization levels Time to provider evaluation	Limited evidence on large-scale implementation Narrative review lacks a systematic methodology.
Van, Loon-van, V., S A G Sven Meylaerts, Ufford, V., A Annemarie Woldhek, Woerden, V., & Van, N. (2024). Improving emergency	Level II/High	Acute Care Hospital Quality Improvement The study addresses ED overcrowding and poor patient flow by evaluating a multi-pronged intervention approach to improve triage efficiency, reduce crowding,	The quality improvement study focuses on emergency department (ED) efficiency, a primary factor contributing to prolonged length of stay (LOS) and	Triage waiting time Crowding levels ED length of stay Patients experience surveys	Short evaluation window No randomization or control

Author, date, and title	Evidence level and quality rating	Focus: HSO type, research domain, and specific problem being addressed	Findings that help answer the review question(s)	Metrics and measures if used	Source limitations
department flow by introducing four interventions simultaneously. A quality improvement project.		and enhance operational flow during peak hours.	compromised quality of care.		
Samadbeik, M., Staib, A., Boyle, J., Khanna, S., Bosley, E., Bodnar, D., Lind, J., Austin, J. A., Tanner, S., Meshkat, Y., de Courten, B., & Sullivan, C. (2024). Patient flow in emergency departments: a comprehensive umbrella review of solutions and challenges across the health system.	Level III/High	Acute Care Hospital Quality Improvement The specific problem is the widespread of ED overcrowding and fragmented patient flow across the healthcare system.	The study provides a number of evidence-based interventions that improve patient flow in the emergency department. Some of these interventions include bed management, staff flexibility, and triage protocols.	Patient experiences Population health Staff satisfaction System efficiency ED occupancy	Umbrella Review The elderly population was underrepresented in this study.
Mostafa, R., & El-Atawi, K. (2024). Strategies to measure and improve emergency department performance: A review	Level V/High	Acute Care Hospital Quality Improvement The specific problem addressed in this study is ED overcrowding and inefficiency in patient care delivery, which is exacerbated by increasing	The literature review identifies key strategies, including triage optimization protocols, technology integration, and dynamic staffing models, which support the 4-hour standard.	ED length of stay Wait time to triage Patient satisfaction scores	Literature review- not a systematic review Limited detail on the methodological rigor of included studies. Lacks real-world implementation outcomes.

Author, date, and title	Evidence level and quality rating	Focus: HSO type, research domain, and specific problem being addressed	Findings that help answer the review question(s)	Metrics and measures if used	Source limitations
		demand, limited resources, and variability in performance measures.			
Sartini, M., Carbone, A., Demartini, A., Giribone, L., Oliva, M., Spagnolo, A. M., Cremonesi, P., Canale, F., & Cristina, M. L. (2022). Overcrowding in Emergency Department: Causes, Consequences, and Solutions—A Narrative Review.	Level V/High	Acute Care Hospital Quality Improvement The article addresses the widespread occurrence of ED overcrowding, identifying its causes, consequences, and strategies for addressing the issue.	The study identifies micro- and macro-level strategies to mitigate ED overcrowding, which can help optimize length of stay and improve the quality of care for elderly patients.	ED occupancy rates Length of Stay Wait time for the provider Mortality and readmission rates Rate of patients leaving without being seen (LWBS)	Narrative instead of systematic review Language bias Population variability

Appendix D: DHA Thematic Analysis Results

Author(s) and date	Findings with Initial Codes	Code List for Theme Development
Ehrlich, A., Erickson, M., Oh, E.S., James, T. & Saxena, S. (2023)	<p>ED overcrowding stems from ED boarding, which compromises patient care and safety. Solutions may include streamlining admission processes, implementing fast-track protocols, and expanding inpatient capacity.</p> <p>Initial Codes: ED overcrowding solutions Admission process redesign Fast-track protocols Capacity expansion</p>	<p>Reducing ED Boarding ED Throughput Optimization Care Flow Optimization Risk Mitigation Techniques</p>
Agency for Healthcare Research and Quality. (2025)	<p>ED boarding is a recognized crisis. Addressing this includes strict adherence to the four-hour boarding standard, implementing transfer protocols, and enhancing inpatient discharge planning.</p> <p>Initial Codes: Four-hour rule Transfer protocols Inpatient discharge planning Boarding mitigation</p>	<p>Regulatory Compliance Strategies Streamlined Transfer Protocols Discharge Efficiency Reducing Patient Harm</p>
Ahmadzadeh, B., Patey, Dr. C., Norman, P., Farrell, A., Knight, J.,	<p>Artificial intelligence (AI) can reduce ED wait times and improve care delivery through predictive modeling, real-time triage decision-</p>	<p>AI Applications in Emergency Care Technology-Driven Triage</p>

Author(s) and date	Findings with Initial Codes	Code List for Theme Development
Czarnuch, S., & Asghari, Dr. S. (2025)	making, and automated resource allocation. Initial Codes: AI-based triage Predictive modeling Automated resource allocation Wait time reduction Resource restraints Artificial intelligence	Resource Optimization Tools Workflow Innovation
Song, L., Aickelin, U., Fazio, T. N., Sharma, A., Kouhounestani, M., Plumb, S., & Putland, M. J. (2025).	Machine learning aids disposition decisions and predicts length of stay, enhancing ED throughput and operational decision-making. Initial Codes: Predictive LOS tools Disposition planning ML-based triage ED flow improvement	Predictive Decision Support Disposition Efficiency Length of Stay Management Technology-Driven Triage
Hirani, R., Podder, D., Stala, O., Mohebpour, R., Tiwari, R. K., & Etienne, M. (2025)	Hospital Length of Stay (HLOS) plays a significant role in healthcare costs and resource utilization. By addressing extended stays, we can improve hospital efficiency and patient throughput. Initial Codes: Pre-discharge planning strategies Transitional care programs Medication reconciliation	Patient-Centered Discharge Planning Strategies to Reduce LOS Care Continuity and Coordination Reducing Avoidable Readmissions

Author(s) and date	Findings with Initial Codes	Code List for Theme Development
	Caregiver engagement	
Garcia, E., & Hass, Z. J. (2025).	Pre-discharge interventions for older adults were categorized into eight strategy types, including structured discharge planning, transitional care coordination, medication reconciliation, and caregiver involvement, all aimed at reducing LOS by ensuring safer and more efficient post-discharge transitions. Initial Codes: Structure discharge planning Transitional care coordination Medication safety reconciliation Caregiver engagement in discharge planning	Early Discharge Readiness Planning Continuity of Care & Safe Transitions Medication Safety at Discharge Family/Caregiver Supported Care
Savioli, G., Ceresa, I., Bressan, M., Gaia Bavestrello Piccini, Novelli, V., Cutti, S., Ricevuti, G., Esposito, C., Longhitano, Y., Piccioni, A., Zoubir Boudi, Venturi, A., Damiano Fuschi, Voza, A., Leo, R., Abdelouahab Bellou, & Enrico Oddone. (2024)	The study highlights how elderly patients in overcrowded emergency departments are frequently subjected to triage inaccuracies, leading to inappropriate care prioritization, delayed treatment, and poorer outcomes. The study recommends the implementation of age-adjusted triage protocols, geriatric-focused training for ED staff, and adoption of five-level triage systems to reduce both under- and over-triage of elderly patients. Initial Codes:	Geriatric-Sensitive Triage Solutions Triage Accuracy and Standardization Training and Workforce Readiness Reducing Delays Through Protocol Reform

Author(s) and date	Findings with Initial Codes	Code List for Theme Development
	Age-specific triage modifications Geriatric-focused triage training Triage standardization policies Five-level triage implementation	
Davis, P & Evans, D. (2021)	The article identifies that standard triage systems, such as ESI, frequently fail older adults due to atypical presentations. To address this gap, the review suggests incorporating geriatric-specific assessments into triage, integrating functional status and frailty screening, and training ED personnel in geriatric triage modifications to increase accuracy and timely prioritization. Initial Codes: Frailty and functional screening in triage Geriatric assessment integration into triage Age-adjusted triage protocols Staff training in geriatric recognition	Geriatric-Specific Triage Enhancement Frailty-Based Risk Screening Training and Workforce Preparedness Improving the Accuracy of Early Prioritization
Van, Loon-van, V., S A G Sven Meylaerts, Ufford, V., A Annemarie Woldhek, Woerden, V., & Van, N. (2024)	Implementation of four targeted interventions during peak ED hours improved operational efficiency, enhanced patient safety, and reduced crowding. Strategies included workflow redesign, assigning float staff during peak hours, and triage support to enhance throughput and	Flow Optimization Strategies Targeted Staffing Interventions Triage Efficiency Models System-Level ED Reforms

Author(s) and date	Findings with Initial Codes	Code List for Theme Development
	<p>reduce wait times, even though overall LOS remained unchanged.</p> <p>Initial Codes: Workflow redesign strategies Peak-time staffing models Patient throughput initiatives ED congestion alleviation techniques</p>	
<p>Samadbeik, M., Staib, A., Boyle, J., Khanna, S., Bosley, E., Bodnar, D., Lind, J., Austin, J. A., Tanner, S., Meshkat, Y., de Courten, B., & Sullivan, C. (2024)</p>	<p>The review found that improving ED patient flow requires a system-wide approach that extends beyond the emergency department. Recommended solutions include strengthening community-based care to prevent avoidable ED visits, instituting rapid assessment models inside the ED to streamline throughput, and expanding inpatient transfer and discharge pathways to remove exit bottlenecks.</p> <p>Initial Codes: System-wide care coordination Integrated patient flow redesign Multi-phase intervention planning Strengthening pre- and post-ED capacity</p>	<p>Whole-System Coordination Strategies Integrated Flow Redesign Across Continuum Strengthening Pre-ED and Post-ED Capacity Rapid Assessment/ Early Escalation Protocols</p>
<p>Mostafa, R., & El-Atawi, K. (2024)</p>	<p>The review highlights strategies to enhance ED structural performance, including triage optimization, dynamic staffing models, and the use of telemedicine and advanced diagnostics.</p>	<p>Performance Improvement Frameworks Reducing Wait Times Through Innovation</p>

Author(s) and date	Findings with Initial Codes	Code List for Theme Development
	<p>These measures were shown to reduce ED wait times, increase throughput, and improve overall quality of care.</p> <p>Initial Codes: Telemedicine integration Triage protocol optimization Performance measurement tools Dynamic staffing tools</p>	<p>Workforce Optimization Strategies Technology-Enhanced ED Operations</p>
<p>Sartini, M., Carbone, A., Demartini, A., Giribone, L., Oliva, M., Spagnolo, A. M., Cremonesi, P., Canale, F., & Cristina, M. L. (2022)</p>	<p>The narrative review emphasizes that addressing ED overcrowding requires both microlevel (within-ED) and macrolevel (hospital-wide) strategies. Proposed solutions include implementing dedicated fast-track units, applying predictive analytics to anticipate surges, optimizing bed management, improving discharge coordination, and integrating hospital-wide operational flow protocols. These interventions aim to minimize ED bottlenecks, enhance care delivery speed, and prevent adverse outcomes associated with delays.</p> <p>Initial codes: Micro-level fast-track implementation Macro-level hospital throughput initiatives Discharge coordination protocols Bed management strategies</p>	<p>Multilevel ED Overcrowding Solutions Predictive and Proactive Planning Real-Time Capacity Management Hospital-Wide Throughput Optimization</p>

Appendix E: Final Concept/Thematic Map

