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Enhancing Clinical Throughput And Patient Safety In Ocular Emergencies: An Integrated Analysis Of Emergency Medicine, Nursing, Pharmacotherapy, Opticianry Services, And Administrative Healthcare Leadership

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Abstract

Background

Ocular emergencies represent a significant yet often underestimated burden within emergency care systems. Conditions such as acute vision loss, ocular trauma, infectious keratitis, and chemical injuries demand rapid clinical decision-making to preserve visual function and prevent long-term disability. However, emergency departments frequently encounter challenges related to prolonged waiting times, fragmented care pathways, medication errors, and suboptimal interdisciplinary coordination, all of which compromise patient safety and clinical throughput.

Aim

This paper aims to critically examine clinical throughput and patient safety in ocular emergency care through an integrated, interdisciplinary lens encompassing emergency medicine, nursing, pharmacotherapy, opticianry services, and administrative healthcare leadership.

Methods

A narrative literature review was conducted using peer-reviewed sources published up to 2022. The review synthesized evidence from emergency medicine, ophthalmology, nursing science, pharmacotherapy, health services research, and healthcare management. Emphasis was placed on identifying operational barriers, safety risks, and best practices influencing patient flow and outcomes in ocular emergencies. Unlike systematic reviews, this study adopted a thematic and integrative approach to allow conceptual synthesis across disciplines.

Results

The literature revealed that inefficiencies in ocular emergency throughput are primarily driven by delayed triage, limited access to specialized diagnostics, medication-related errors, and insufficient coordination among clinical and administrative stakeholders. Nursing-led triage prwasols, standardized pharmacotherapy pathways, early opticianry involvement, and leadership-driven operational redesign were consistently associated with improved patient safety and reduced waiting times. Administrative leadership emerged as a critical enabler for aligning clinical workflows, resource allocation, and quality improvement initiatives.

Conclusion

Enhancing clinical throughput and patient safety in ocular emergencies requires a systems-based, interdisciplinary approach that integrates clinical expertise with organizational leadership. The findings support the development of coordinated care models that emphasize timely assessment, medication safety, diagnostic efficiency, and strategic management oversight. Such models have the potential to improve visual outcomes, patient satisfaction, and healthcare system performance.

Keywords Ocular emergencies; Clinical throughput; Patient safety; Emergency nursing; Pharmacotherapy; Opticianry services; Healthcare leadership.

1. Introduction

Ocular emergencies constitute a critical subset of presentations within emergency care settings, encompassing a wide spectrum of conditions ranging from minor eye injuries to vision-threatening and life-altering pathologies. Acute angle-closure glaucoma, retinal detachment, chemical burns, infectious keratitis, and penetrating ocular trauma require prompt recognition and immediate intervention to prevent irreversible visual impairment (Vaziri et al., 2019). Despite their clinical urgency, ocular emergencies are frequently deprioritized within overcrowded emergency departments, leading to prolonged waiting times, fragmented care delivery, and increased risk of adverse outcomes.

Emergency departments worldwide face persistent challenges related to increasing patient volumes, limited specialist availability, and constrained resources. Within this context, ocular emergencies often compete with other high-acuity conditions for clinical attention and diagnostic access (Bourcier et al., 2018). Delays in assessment and treatment have been consistently associated with poorer visual outcomes, increased complication rates, and higher healthcare costs. Consequently, improving clinical throughput in ocular emergencies is not merely an operational concern but a fundamental patient safety imperative.

Clinical throughput refers to the efficiency with which patients move through healthcare processes from presentation to definitive care and disposition. In ocular emergencies, throughput is influenced by multiple interdependent factors, including triage accuracy, availability of diagnostic tools, timely pharmacological intervention, interdisciplinary communication, and administrative oversight (Asplin et al., 2003). Inefficiencies at any stage of the care continuum can propagate delays, increase clinician workload, and compromise patient safety.

Patient safety in ocular emergency care extends beyond the prevention of procedural errors to encompass medication safety, diagnostic accuracy, infection control, and continuity of care. Pharmacotherapy errors, particularly involving topical anesthetics, mydriatics, corticosteroids, and antimicrobial agents, pose significant risks when protocols are inconsistently applied or poorly coordinated across care teams (Fraunfelder & Fraunfelder, 2017). Nurses play a pivotal role in mitigating these risks through accurate medication administration, patient education, and early detection of adverse effects.

Opticianry and ophthalmic diagnostic services represent another critical yet underutilized component of ocular emergency care. Timely visual acuity assessment, intraocular pressure measurement, slit-lamp examination, and fundoscopic evaluation can significantly expedite diagnosis and management decisions

(Mowatt et al., 2008). However, limited integration of opticianry services into emergency workflows often results in diagnostic delays and unnecessary specialist referrals.

Beyond clinical disciplines, administrative healthcare leadership exerts a substantial influence on ocular emergency outcomes. Leadership decisions related to staffing models, protocol standardization, workflow redesign, and quality improvement initiatives directly affect clinical throughput and safety culture (Institute of Medicine, 2001). Evidence from emergency medicine and health services research suggests that leadership-driven interventions, such as Lean methodologies and multidisciplinary care pathways, can markedly improve efficiency and patient outcomes when effectively implemented (Toussaint & Berry, 2013).

Despite the recognized importance of interdisciplinary collaboration, existing literature often addresses ocular emergencies within isolated professional silos. Studies may focus exclusively on ophthalmological management, nursing interventions, or administrative efficiency without adequately exploring their intersections. This fragmented approach limits the development of comprehensive care models capable of addressing the complex, multifactorial challenges inherent in ocular emergency care.

Therefore, there is a pressing need for an integrated analysis that synthesizes insights from emergency medicine, nursing, pharmacotherapy, opticianry services, and healthcare administration. By examining these domains collectively, it becomes possible to identify synergistic strategies that enhance both clinical throughput and patient safety. This paper responds to that need by providing a narrative literature review that bridges disciplinary boundaries and proposes an integrated framework for ocular emergency care.

2. Aim and Objectives

Aim

The primary aim of this study is to critically analyze factors influencing clinical throughput and patient safety in ocular emergency care through an integrated, interdisciplinary perspective encompassing emergency medicine, nursing, pharmacotherapy, opticianry services, and administrative healthcare leadership.

Objectives

1. To examine the clinical and operational challenges affecting patient flow in ocular emergency settings.
2. To identify patient safety risks associated with delayed assessment, medication management, and diagnostic processes in ocular emergencies.
3. To analyze the roles and contributions of emergency physicians, nurses, pharmacists, opticians, and healthcare administrators in optimizing ocular emergency care.
4. To synthesize evidence-based strategies that enhance interdisciplinary collaboration and operational efficiency.
5. To propose an integrated conceptual model aimed at improving clinical throughput and patient safety in ocular emergency services.

3. Conceptual Framework

The conceptual framework underpinning this study is grounded in systems theory and interdisciplinary care models, which view healthcare delivery as a dynamic interaction among clinical, organizational, and human factors. In ocular emergency care, patient outcomes are shaped not only by clinical expertise but also by the efficiency of processes, communication pathways, and leadership structures (Reason, 2000).

At the core of the framework is the patient journey, beginning with emergency department presentation and extending through assessment, diagnosis, treatment, and disposition. Emergency medicine serves as the initial access point, where rapid triage and early clinical decision-making are essential. Accurate prioritization of ocular complaints is critical to prevent delays in time-sensitive conditions such as chemical injuries and acute glaucoma (Bourcier et al., 2018).

Nursing practice forms the operational backbone of ocular emergency care. Nurses are responsible for initial assessments, implementation of safety protocols, medication administration, and ongoing patient monitoring. Their role in early recognition of deterioration and adherence to standardized care pathways significantly influences both throughput and safety outcomes (Benner et al., 2010).

Pharmacotherapy intersects with every stage of ocular emergency management. Medication selection, dosing accuracy, and monitoring for adverse effects require close coordination between prescribers and nursing staff. Standardized pharmacological protocols and pharmacist involvement have been shown to reduce medication errors and improve therapeutic outcomes in emergency settings (Leape et al., 2009).

Opticianry services contribute specialized diagnostic expertise that enhances clinical decision-making. Integration of opticians into emergency workflows enables rapid assessment of visual function and ocular structures, reducing unnecessary delays and referrals (Mowatt et al., 2008).

Surrounding these clinical components is administrative healthcare leadership, which provides governance, resource allocation, and quality oversight. Leadership commitment to patient safety culture, interdisciplinary collaboration, and continuous improvement is essential for sustaining efficient ocular emergency services (Institute of Medicine, 2001).

This framework conceptualizes ocular emergency care as an interconnected system in which optimal outcomes depend on alignment across disciplines, processes, and leadership.

4. Literature Review Methodology

This study employed a narrative literature review methodology designed to synthesize diverse bodies of knowledge relevant to ocular emergency care. Unlike systematic reviews, which prioritize exhaustive search strategies and quantitative aggregation, narrative reviews facilitate conceptual integration across disciplines and are particularly suitable for complex healthcare topics involving organizational and clinical dimensions (Green et al., 2006).

Peer-reviewed literature published up to 2022 was examined across emergency medicine, ophthalmology, nursing, pharmacotherapy, opticianry, and healthcare management domains. Sources included original research articles, clinical guidelines, and authoritative reviews. Emphasis was placed on studies addressing clinical throughput, patient safety, interdisciplinary collaboration, and leadership interventions in emergency care settings.

The literature was analyzed thematically, with key concepts grouped into domains reflecting the study objectives. These domains included triage efficiency, medication safety, diagnostic integration, nursing practice, and administrative leadership. Through iterative synthesis, relationships among themes were identified, enabling the development of an integrated conceptual model.

5. Clinical Throughput in Ocular Emergencies

Clinical throughput in ocular emergencies refers to the timeliness and efficiency with which patients progress through assessment, diagnosis, treatment, and disposition within emergency care settings. Efficient throughput is particularly critical in ophthalmic emergencies due to the narrow therapeutic windows associated with many vision-threatening conditions, including chemical injuries, central retinal artery occlusion, acute angle-closure glaucoma, and infectious keratitis (Vaziri et al., 2019).

Emergency department crowding remains a primary barrier to optimal throughput. Ocular emergencies are often categorized as non–life-threatening and consequently experience delays despite their potential for irreversible morbidity. Studies have demonstrated that delays exceeding two hours in managing certain ocular conditions significantly increase the risk of permanent visual impairment (Bourcier et al., 2018). These delays are frequently linked to triage misclassification, limited access to ophthalmic diagnostic equipment, and fragmented referral pathways.

Triage accuracy is the first determinant of ocular emergency throughput. Traditional emergency triage systems may inadequately capture ophthalmic urgency, leading to under-prioritization of eye-related complaints (Asplin et al., 2003). The integration of symptom-specific triage algorithms, supported by nursing-led assessments, has been shown to improve prioritization and reduce time-to-treatment. Visual acuity loss, ocular pain severity, photophobia, and chemical exposure history are key indicators that must be rapidly identified to expedite care.

Diagnostic delays further compromise throughput. Limited availability of slit-lamp examinations, tonometry, and fundoscopic evaluation often necessitates specialist consultation, which may not be immediately available in many emergency departments. Evidence suggests that early involvement of opticianry or trained ophthalmic personnel significantly reduces diagnostic bottlenecks and accelerates clinical decision-making (Mowatt et al., 2008).

Pharmacological readiness also plays a critical role in throughput. Delays in medication access—such as topical antibiotics, cycloplegics, intraocular pressure–lowering agents, and analgesics—can prolong patient stays and worsen outcomes. Standardized emergency ophthalmic medication kits and pre-approved standing orders have been associated with reduced treatment initiation times (Leape et al., 2009).

From an operational perspective, throughput inefficiencies are rarely attributable to a single factor. Instead, they arise from cumulative process failures across triage, diagnostics, medication administration, and disposition planning. Addressing these challenges requires coordinated process redesigning rather than isolated interventions, as shown in **Table 1.**

Table 1. Key Factors Affecting Clinical Throughput in Ocular Emergencies

Domain	Barrier	Impact on Throughput
Triage	Under-prioritization of ocular complaints	Delayed assessment
Diagnostics	Limited access to slit-lamp/tonometry	Prolonged length of stay
Pharmacotherapy	Medication availability delays	Treatment initiation lag
Staffing	Limited ophthalmic expertise	Increased referrals
Administration	Fragmented workflows	System-wide inefficiency

6. Patient Safety in Ocular Emergency Care

Patient safety in ocular emergency care encompasses the prevention of diagnostic errors, medication-related adverse events, procedural complications, and communication failures. Due to the delicate anatomy of the eye and the potential for irreversible damage, even minor errors can have profound consequences (Fraunfelder & Fraunfelder, 2017).

Medication represents one of the most critical concerns in ocular emergencies. Commonly used agents, including topical anesthetics, corticosteroids, mydriatics, and antimicrobial drops—carry significant risks

if improperly administered. For example, inappropriate corticosteroid use in undiagnosed infectious keratitis may exacerbate disease progression and result in vision loss (Leape et al., 2009).

Nursing practice is central to safeguarding patient safety. Nurses are responsible for medication administration accuracy, allergy verification, patient education, and monitoring for adverse effects. Studies have consistently shown that structured nursing protocols and double-check systems significantly reduce medication errors in emergency settings (Benner et al., 2010).

Diagnostic safety is another major dimension. Misdiagnosis or delayed diagnosis of ocular emergencies remains a documented problem, particularly in non-specialized emergency departments. Conditions such as retinal detachment or acute glaucoma may initially present with nonspecific symptoms, increasing the risk of misclassification (Vaziri et al., 2019). The integration of opticianry assessments and standardized diagnostic checklists has been shown to improve diagnostic accuracy and safety.

Infection prevention is particularly important in ocular trauma and post-procedural care. Failure to adhere to aseptic techniques or delayed antimicrobial therapy can lead to endophthalmitis and permanent vision loss. Evidence supports the implementation of standardized infection control bundles tailored to ophthalmic emergencies (Bourcier et al., 2018).

Communication failures between disciplines further undermine patient safety. Inadequate handovers, unclear medication orders, and delayed consultations contribute to adverse events. Structured interdisciplinary communication tools, such as SBAR (Situation–Background–Assessment–Recommendation), have demonstrated effectiveness in reducing errors and improving care continuity (Reason, 2000) as shown in **Table 2**.

Table 2. Patient Safety Risks and Mitigation Strategies in Ocular Emergencies

Safety Risk	Contributing Factor	Mitigation Strategy
Medication errors	Complex regimens	Standardized protocols
Misdiagnosis	Limited ophthalmic expertise	Diagnostic checklists
Infection	Delayed treatment	Care bundles
Communication failure	Fragmented teams	Structured handovers

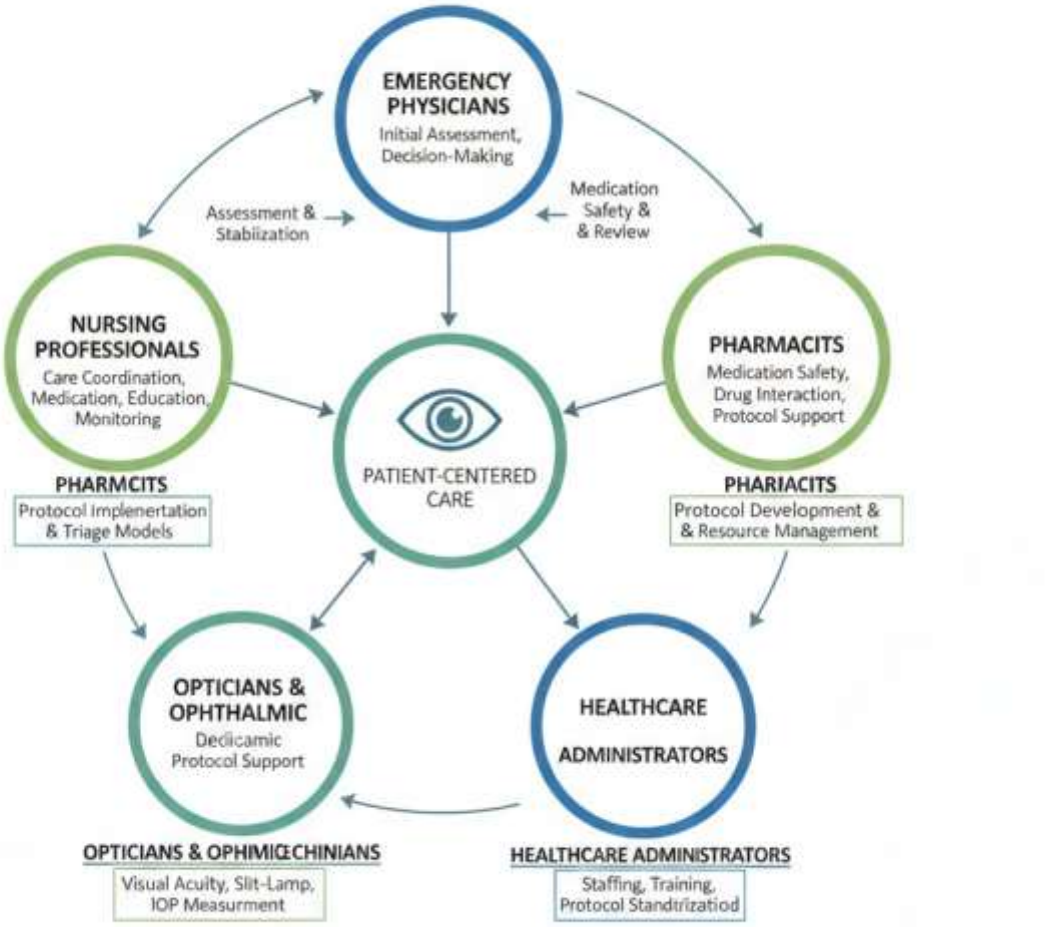
7. Interdisciplinary Roles in Ocular Emergency Care

Interdisciplinary collaboration is the cornerstone of effective ocular emergency management. Emergency physicians, nurses, pharmacists, opticians, and administrators each contribute specialized expertise that collectively determines patient outcomes.

- **Emergency physicians** are responsible for initial assessment, stabilization, and decision-making. Their ability to recognize vision-threatening conditions and initiate appropriate interventions is critical to preserving visual function.
- **Nursing professionals** serve as coordinators of care, ensuring timely assessments, medication administration, patient education, and monitoring. Nursing-led triage models have been associated with improved throughput and reduced adverse events (Benner et al., 2010).
- **Pharmacists** contribute to medication safety by reviewing prescriptions, preventing drug interactions, and supporting protocol development. Pharmacist involvement in emergency departments has been shown to significantly reduce medication errors (Leape et al., 2009).

- **Opticians and ophthalmic technicians** enhance diagnostic efficiency by performing visual acuity assessments, slit-lamp examinations, and intraocular pressure measurements. Their integration into emergency workflows reduces diagnostic delays and unnecessary specialist referrals (Mowatt et al., 2008).
- **Healthcare administrators** provide the structural and operational framework necessary for interdisciplinary collaboration. Their decisions regarding staffing, training, and protocol standardization directly influence care quality and efficiency (Institute of Medicine, 2001).

Figure 1. Interdisciplinary Roles and Interactions in Ocular Emergency Care



8. Administrative & Leadership Strategies

Administrative leadership plays a pivotal role in optimizing ocular emergency care by aligning clinical goals with operational efficiency. Leadership commitment to patient safety culture, continuous quality improvement, and interdisciplinary collaboration is essential for sustainable improvement (Toussaint & Berry, 2013).

Lean management principles have been successfully applied in emergency settings to streamline workflows, reduce waste, and improve throughput. Leadership-driven initiatives such as protocol standardization, performance monitoring, and staff empowerment have demonstrated measurable improvements in patient outcomes.

Resource allocation decisions—including staffing ratios, diagnostic equipment availability, and training programs—directly affect ocular emergency performance. Leaders who prioritize ophthalmic preparedness within emergency departments enable faster, safer care delivery as shown in **Table 3.**

Table 3. Leadership Strategies and Their Impact on Ocular Emergency Outcomes

Strategy	Outcome
Lean workflow redesign	Reduced waiting times
Protocol standardization	Improved safety
Staff training	Enhanced diagnostic accuracy
Performance monitoring	Sustained improvements

9. Proposed Integrated Model for Ocular Emergency Care

This paper proposes an integrated care model that aligns clinical expertise with administrative leadership to enhance throughput and patient safety. The model emphasizes early triage, interdisciplinary collaboration, standardized pharmacotherapy, and leadership oversight.

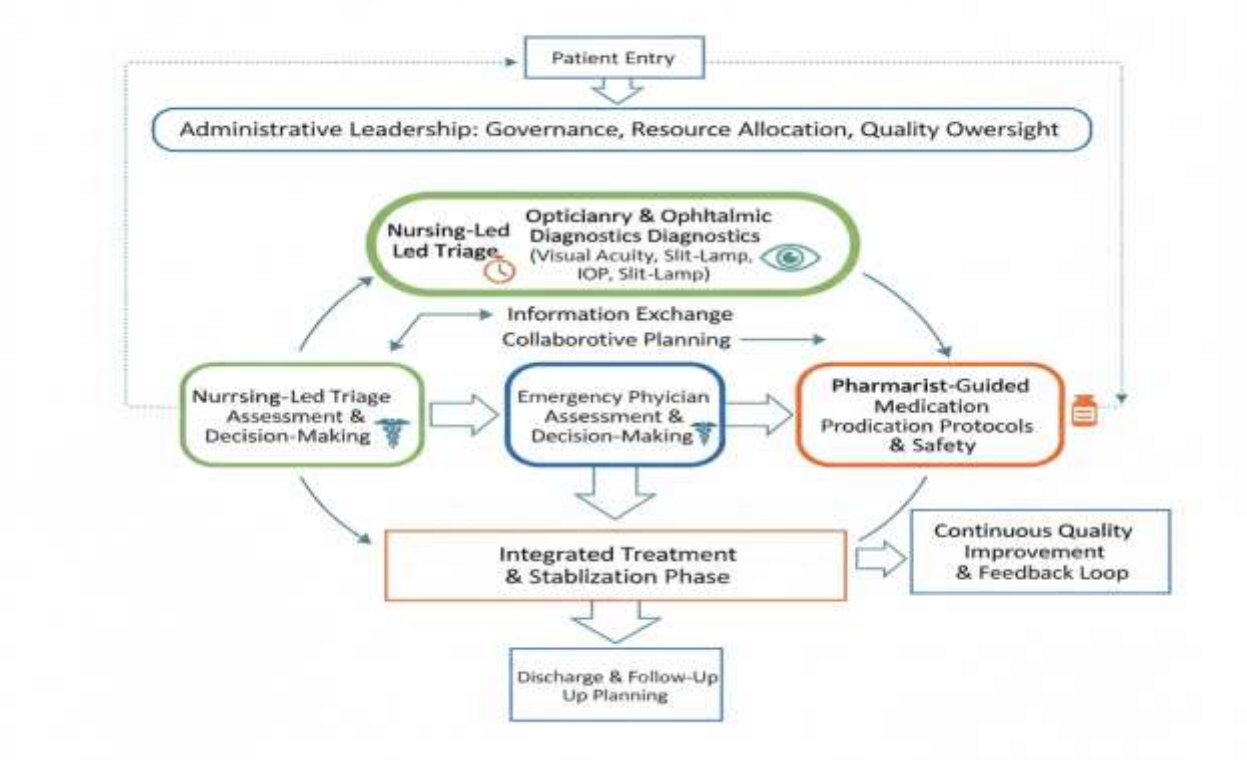


Figure 2. Proposed Integrated Ocular Emergency Care Model

The model positions nursing-led triage as the entry point, supported by opticianry diagnostics and pharmacist-guided medication protocols. Administrative leadership provides governance, resource allocation, and continuous quality improvement as shown in **Table 4.**

Table 4. Expected Outcomes of the Integrated Model

Domain	Expected Improvement
Throughput	Reduced length of stay
Safety	Fewer medication errors
Quality	Improved visual outcomes
Efficiency	Optimized resource use

10. Discussion

This narrative literature review provides an integrated examination of clinical throughput and patient safety in ocular emergency care, highlighting the interdependent roles of emergency medicine, nursing, pharmacotherapy, opticianry services, and administrative healthcare leadership. The findings underscore that inefficiencies and safety risks in ocular emergencies are not solely clinical in origin but are deeply embedded within organizational structures, workflow design, and interdisciplinary communication patterns.

One of the most salient insights emerging from the literature is that ocular emergencies are consistently vulnerable to under-triage and delayed intervention. Despite the potential for irreversible visual impairment, eye-related complaints are frequently deprioritized in emergency departments dominated by life-threatening conditions. This phenomenon reflects a structural limitation of conventional triage systems, which often lack ophthalmic-specific urgency indicators. The evidence supports the integration of symptom-driven triage algorithms and nursing-led prioritization models to address this gap. Such approaches align with broader emergency medicine research demonstrating that targeted triage protocols improve both throughput and patient outcomes (Asplin et al., 2003).

Clinical throughput in ocular emergencies is further constrained by diagnostic bottlenecks. Limited access to slit-lamp examinations, tonometry, and trained ophthalmic personnel prolongs time-to-diagnosis and increases length of stay. The literature consistently demonstrates that early involvement of opticianry services enhances diagnostic efficiency and reduces unnecessary specialist referrals. These finding challenges traditional care models that reserve diagnostic authority exclusively for ophthalmologists and supports a task-sharing approach grounded in competency-based practice (Mowatt et al., 2008).

Patient safety concerns in ocular emergency care are multifaceted, encompassing medication errors, diagnostic inaccuracies, procedural complications, and communication failures. Pharmacotherapy emerges as a particularly high-risk domain. The inappropriate use of topical corticosteroids, anesthetics, and mydriatic agents has been repeatedly associated with adverse outcomes, especially when administered without a definitive diagnosis. The inclusion of pharmacists in emergency care teams and the adoption of standardized ophthalmic medication protocols has been shown to significantly reduce these risks. These findings reinforce the broader patient safety literature emphasizing the critical role of medication stewardship in high-acuity environments (Leape et al., 2009).

Nursing practice represents a central pillar in both throughput optimization and patient safety. Nurses function as the primary interface between patients and the healthcare system, coordinating assessments,

administering medications, monitoring responses, and facilitating interdisciplinary communication. Nursing-led interventions, including standardized assessment tools and care bundles, have demonstrated effectiveness in reducing delays, preventing errors, and enhancing patient satisfaction. This review supports the recognition of nurses not merely as task executors but as clinical leaders within ocular emergency pathways (Benner et al., 2010).

Interdisciplinary collaboration emerges as a defining determinant of care quality in ocular emergencies. Fragmentation between emergency physicians, nurses, pharmacists, opticians, and administrators undermines efficiency and increases the likelihood of adverse events. Conversely, integrated care models characterized by shared protocols, clear role delineation, and structured communication demonstrate superior outcomes. The findings align with systems-based safety theories, which conceptualize errors as emergent properties of poorly designed systems rather than individual failures (Reason, 2000).

Administrative healthcare leadership plays a decisive role in enabling or constraining improvements in ocular emergency care. Leadership-driven initiatives such as Lean process redesign, protocol standardization, performance monitoring, and workforce development have been consistently associated with enhanced throughput and safety. Importantly, leadership commitment to patient safety culture influences frontline behavior, interdisciplinary trust, and adherence to best practices. The evidence suggests that sustainable improvement in ocular emergency care requires alignment between clinical innovation and organizational governance (Institute of Medicine, 2001).

The proposed integrated model synthesizes these findings into a cohesive framework that positions the patient journey at the center of care delivery. By aligning nursing-led triage, opticianry-supported diagnostics, pharmacist-guided pharmacotherapy, and leadership oversight, the model addresses both clinical and operational determinants of performance. This approach reflects a shift from siloed care toward coordinated systems of practice, consistent with contemporary healthcare quality paradigms.

From a policy perspective, the findings have significant implications. Emergency departments must recognize ocular emergencies as high-risk conditions requiring dedicated protocols, training, and resources. Investment in interdisciplinary education and leadership development is essential to translate evidence into practice. Moreover, performance metrics should extend beyond waiting times to include safety indicators, visual outcomes, and patient-reported experiences.

Collectively, this discussion highlights that improving clinical throughput and patient safety in ocular emergencies is not achievable through isolated interventions. Rather, it necessitates a holistic, interdisciplinary strategy supported by informed leadership and continuous quality improvement.

11. Limitations

This study has several limitations that should be acknowledged. First, as a narrative literature review, the methodology does not follow the systematic rigor of formal systematic reviews or meta-analyses. While this approach enables conceptual integration across diverse disciplines, it may introduce selection bias and limit reproducibility. However, the narrative design was intentionally chosen to accommodate the interdisciplinary and organizational complexity of ocular emergency care.

Second, the reliance on published literature up to 2022 may exclude emerging evidence and recent innovations in emergency ophthalmic care. Nevertheless, the included studies provide a robust and representative foundation for understanding established challenges and best practices.

Third, variations in healthcare systems, resource availability, and professional scopes of practice across regions may limit the generalizability of some findings. The applicability of specific interventions, such as opticianry integration or pharmacist involvement, may depend on local regulatory and organizational contexts.

Finally, this review synthesizes existing evidence without presenting primary empirical data. While this limits causal inference, the study's strength lies in its integrative perspective and its ability to generate actionable insights and conceptual models to guide future research and practice.

12. Conclusion

Ocular emergencies represent a critical intersection of clinical urgency, patient safety, and operational efficiency within emergency care systems. This narrative literature review demonstrates that delays, errors, and inefficiencies in ocular emergency care are rarely attributable to individual clinical failures but instead arise from fragmented systems, inadequate integration, and insufficient leadership engagement.

By synthesizing evidence across emergency medicine, nursing, pharmacotherapy, opticianry services, and healthcare administration, this paper highlights the necessity of interdisciplinary collaboration in optimizing both clinical throughput and patient safety. Nursing-led triage, standardized pharmacotherapy protocols, early diagnostic support from opticianry services, and leadership-driven workflow redesign emerge as key strategies for improving outcomes.

The proposed integrated model offers a practical framework for aligning clinical processes with organizational governance. Its patient-centered design emphasizes timely assessment, accurate diagnosis, safe medication management, and coordinated decision-making. Importantly, the model underscores the role of administrative leadership in sustaining improvements through resource allocation, training, and quality oversight.

For clinical practice, the findings advocate for the recognition of ocular emergencies as high-risk conditions deserving targeted protocols and interdisciplinary expertise. For healthcare leaders, the review reinforces the value of systems thinking and continuous improvement in enhancing emergency care performance. For researchers, the study identifies opportunities for future empirical evaluation of integrated ocular emergency models.

In conclusion, enhancing clinical throughput and patient safety in ocular emergencies requires a paradigm shift from siloed, reactive care toward proactive, interdisciplinary systems supported by effective leadership. Adoption of such approaches has the potential to preserve vision, improve patient experiences, and strengthen the overall quality of emergency healthcare delivery.

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