Analysis of Factors Influencing Emergency Department Nurses' Triage Decision-Making for Patients with Suspected Infectious Diseases

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Abstract: *The emergency department serves as a critical frontline for identifying and isolating patients with suspected infectious diseases and for controlling and preventing nosocomial infections. The accuracy and timeliness of triage decisions directly impact patient safety, public health risks, and the effective allocation of medical resources. This study aims to systematically analyze the multidimensional factors influencing emergency department nurses' triage decisions regarding patients with suspected infectious diseases. The analysis indicates that the decision-making process is profoundly shaped by internal factors related to nurses' individual cognitive foundations, knowledge structures, and clinical experience. These manifest as prototype-based pattern recognition of infectious diseases, contextual adaptation of standardized guidelines through professional knowledge, and experience-driven intuitive judgments with potential cognitive biases. Simultaneously, decision-making is significantly molded by external clinical contexts, including the complexity and informational uncertainty of patient presentations, the rigid constraints of emergency department workload and resource availability, and the effectiveness of interdisciplinary information transfer. Furthermore, the widespread presence of heuristic thinking and cognitive biases during triage decision-making creates a tension with electronic decision-support tools designed to enhance decision consistency. The study suggests that establishing a closed-loop learning mechanism incorporating systematic feedback and structured reflection represents a potential pathway for optimizing the quality of triage decisions and enhancing resilience in responding to emerging and unknown infectious diseases.*

Keywords: *emergency department triage; infectious diseases; clinical decision-making; cognitive factors; contextual factors; decision support*

Introduction

Against the backdrop of persistent global threats from infectious diseases, the emergency department, as the primary gateway of the healthcare system, relies critically on its nurses for the early identification and accurate triage of patients with suspected infections, serving a vital barrier function. This decision-making process is far from a mere application of protocols; it constitutes a complex cognitive and judgmental activity conducted under conditions of uncertainty, time pressure, and resource constraints. Deviations in triage decisions can lead to delayed isolation of high-risk patients, increased risk of cross-infection, or unnecessary strain on medical resources. Consequently, a thorough analysis of the systemic factors influencing these decisions is essential. It pertains not only to improving the quality of individual clinical judgment but also represents a core element in optimizing the effectiveness of emergency department infection control systems and ensuring the resilience of the healthcare system in responding to public health emergencies. The significance and necessity of this study lie in moving beyond a superficial description of triage procedures. It aims to integratively explore the internal cognitive mechanisms and external contextual dynamics that influence nurses' triage decisions from multidimensional perspectives including cognitive science, clinical judgment theory, and organizational management, thereby providing a theoretical foundation for developing more targeted intervention strategies and support systems.

1. Cognitive and Knowledge Structure Elements in Triage Decision-Making for Patients with Suspected Infectious Diseases

1.1 Cognitive Basis for Nurses' Identification and Risk Assessment of Infectious Diseases

The preliminary identification of patients with suspected infectious diseases by emergency department nurses is rooted in their specific cognitive processing model. This process involves rapid pattern recognition of nonspecific clinical symptom clusters and the vigilant integration of epidemiological cues. Nurses do not engage in definitive etiological diagnosis; instead, they construct an initial probability estimate of infection risk based on combinations of key clinical manifestations—such as fever, respiratory symptoms, or rash—alongside information regarding the patient's travel history, occupational exposure, or contact history. This cognitive activity heavily relies on the retrieval and comparison of characteristic prototypes of infectious diseases stored in working memory, constituting a form of heuristic judgment performed under conditions of incomplete information and time pressure.

The stability and accuracy of this cognitive foundation are directly influenced by the currency of the individual's knowledge structure and the model of continuing education. The emergence of novel infectious diseases and shifts in clinical manifestations caused by the mutation of known pathogens both pose challenges to established cognitive prototypes. If the cognitive model fails to iterate in a timely manner, it may lead to identification bias, manifesting as the neglect of atypical symptoms or the underestimation of the possibility of low-probability yet high-risk infectious diseases. Therefore, the cognitive basis is not static but rather a dynamic system requiring continuous input of new evidence for calibration; its quality determines the sensitivity and specificity of the initial risk assessment within triage decision-making[1].

1.2 Divergent Application of Triage Guidelines and Professional Knowledge in Decision-Making

Written triage guidelines provide a standardized theoretical framework for managing patients with suspected infectious diseases, outlining risk stratification pathways based on symptoms and signs. However, in the complex reality of the emergency department, an interpretive space often exists between the abstract principles of the guidelines and the concrete presentation of individual patients. Nurses' professional knowledge plays a crucial role in translating and adapting these guidelines, manifesting as the contextual interpretation of protocol stipulations. For instance, the same degree of fever may carry significantly different clinical implications across patient groups with varying ages, baseline immune statuses, or comorbidities. This necessitates that nurses move beyond the singular thresholds specified in the guidelines to conduct multi-dimensional, integrated clinical judgment.

The emergence of this divergence in application stems from the irreducible complexity of clinical contexts. Guidelines cannot exhaustively account for all possible combinations of clinical variables. When a patient's presentation falls within the ambiguous boundaries of guideline classifications or presents multiple contradictory cues, rigid adherence to protocol may lead to suboptimal decisions. In such instances, deep professional knowledge compels nurses to engage analytical thinking, weighing the significance of different symptoms and evaluating the balance between potential cross-infection risks and clinical urgency. Consequently, triage decision-making is essentially the product of an ongoing dialogue between standardized guidelines and individualized professional judgment. The dynamic tension and the resulting divergence in application between these two constitute a core element influencing the precision of the decisions.

1.3 The Impact of Clinical Experience on Disease Pattern Recognition and Decision-Making Speed

Extensive clinical experience, accumulated through exposure to a high volume of cases, forms a highly organized knowledge repository of disease patterns within a nurse's long-term memory. This patterned knowledge enables experienced nurses to bypass lengthy analytical reasoning, rapidly identifying key information in an intuitive manner to achieve a nearly automated preliminary classification. When encountering typical presentations of common infectious diseases, this experience-based intuitive judgment can significantly enhance triage efficiency, shortening the critical time window from patient admission to the initiation of isolation measures. This holds substantial value for controlling the spread of nosocomial infections[2].

Nevertheless, the effect of clinical experience on accelerating decision-making coexists with

potential risks. Over-reliance on pattern recognition may lead to an "anchoring effect," where an initial judgment is formed prematurely, resulting in insufficient attention to subsequently emerging, contradictory information that does not align with the initial pattern. This risk is particularly pronounced when facing emerging infectious diseases with atypical clinical presentations, as the entrenched patterns from past experience may become ineffective or even misleading. Therefore, the value of experience lies not only in accelerating the processing of familiar situations but also in cultivating a prudent metacognitive ability. This involves maintaining awareness of one's own judgment process and establishing a balance between rapid intuition and careful review. Consequently, while enhancing speed, this approach also maintains and optimizes the adaptability of decisions and their robustness when confronting unknown threats.

2. The Shaping of Triage Decision-Making by Clinical Context and Informational Factors

2.1 Challenges Posed by the Complexity of Patient Clinical Presentations and Informational Uncertainty

The early clinical manifestations of patients with suspected infectious diseases often exhibit a high degree of nonspecificity and overlap. Common symptoms such as fever, fatigue, respiratory discomfort, or gastrointestinal symptoms can be present across a wide spectrum of both infectious and non-infectious diseases. This symptomatic ambiguity makes it difficult for nurses at the triage point to perform a clear etiological classification based on a single or a limited number of clinical signs. Furthermore, patients' own descriptions of their symptoms may be influenced by subjective perception, communication ability, or sociocultural background, thereby introducing informational bias or omission, which further exacerbates uncertainty during the initial assessment stage[3].

Confronted with this complexity, triage decision-making essentially involves risk estimation based on a limited, ambiguous, and potentially dynamic set of information. Informational uncertainty significantly increases cognitive load, compelling nurses to rely on probabilistic judgments rather than definitive diagnoses. Under time pressure, to reduce this uncertainty, nurses may adopt heuristic strategies, such as focusing more on typical or severe symptoms while assigning relatively lower weight to subtle, atypical warning signs. Although this coping mechanism can improve decision-making efficiency, it may also systematically underestimate the contagion risk in patients with concealed clinical presentations or those in the early window period of the disease, constituting a sensitivity issue in triage screening.

2.2 Contextual Constraints of Emergency Department Workload and Resource Availability

The inherently high throughput, unpredictability, and multitasking environment of the emergency department constitute the macro-contextual backdrop for triage decision-making. When patient volumes surge and critical cases cluster, both nursing manpower and physical space resources become strained. Within this context, the time available for assessing each patient at triage is compressed, and nurses may be unable to conduct thorough information gathering and inquiry, causing the decision-making process to tend toward simplification. Furthermore, the immediate availability of critical resources, such as isolation rooms, personal protective equipment, and rapid testing kits, directly influences the feasibility of decision options.

Resource constraints directly shape the boundaries of decision-making and the prioritization process. When resources are relatively sufficient, decisions may tend to follow a "sensitivity-first" principle, relaxing isolation criteria to avoid missed cases. When resources are highly strained, the decision logic may be forced to shift toward "specificity-first," adopting stricter standards to allocate limited isolation resources to ensure that high-risk cases are managed. However, this approach may be accompanied by a certain rate of false-negative risk. Therefore, triage decisions are not made in an ideal vacuum; rather, they represent a contextually adaptive solution that nurses seek after dynamically assessing clinical risks and real-time resource limitations. Resource availability, as a rigid constraint, profoundly influences the decision thresholds and the selection of subsequent management pathways.

2.3 The Role of Interprofessional Communication and Information Transfer in the Triage Chain

The identification and triage of patients with suspected infectious diseases is not a closed-loop task independently completed by emergency department nurses, but rather an information relay and

collaborative process involving multiple steps and professions. The efficacy of triage decision-making is highly dependent on the fidelity and flow efficiency of information within this chain. Preliminary information obtained by nurses from patients, family members, or transport personnel needs to be communicated clearly and accurately to the attending physicians, laboratory departments, and infection control departments. Any instance of information loss, distortion, or delay in any link of this chain may lead to bias in subsequent clinical judgment or lag in the initiation of prevention and control measures.

The effectiveness of this communication system depends on the establishment of shared mental models and the use of structured informational tools. A shared mental model implies that relevant professionals possess a common foundational understanding of infectious disease risk indicators, the meanings of different isolation levels, and emergency response protocols. Structured handover tools or standardized assessment fields within electronic medical records help reduce arbitrariness and ambiguity in communication. Information transfer is not limited to the initial stage; it also includes the provision of feedback and updates after obtaining preliminary laboratory results or observing changes in the patient's condition. A fluid, closed-loop communication network can extend the triage decision from a single-point judgment into a continuous process of risk monitoring and dynamic adjustment, thereby enhancing the system's overall capacity for early identification and containment of potential infectious disease patients.

3. Judgment Biases and Efficacy Optimization Mechanisms in the Triage Decision-Making Process

3.1 The Manifestation of Heuristic Thinking and Common Cognitive Biases in Triage

Within the high-load, high-uncertainty decision-making environment of the emergency department, nurses' triage judgments are profoundly dominated by heuristic thinking at the cognitive level. This constitutes a psychological simplification strategy evolved to cope with information overload and time pressure. The representativeness heuristic prompts decision-makers to analogically match the current patient's symptom constellation with the typical infectious disease "schema" stored in memory; the higher the degree of match, the stronger the likelihood judgment for classifying it as that disease. The availability heuristic makes features of cases that have been frequently encountered recently, widely discussed, or carry strong emotional impact more readily retrievable from memory, thereby unconsciously inflating the subjective estimation of their epidemiological probability. While these heuristics ensure the timeliness of decisions, their inherent simplific nature also forms the structural root of systematic misjudgment[4].

The introduction of cognitive biases further complicates this judgment process. The anchoring effect causes the initially obtained limited information (such as the chief complaint "fever for two days") to become a fixed starting point for assessment, with subsequent information, even if contradictory, often assigned a lower weight for adjustment. Confirmation bias drives nurses to selectively collect and interpret information to confirm a preliminary hypothesis, while ignoring or discounting clinical clues that challenge it (such as an inconsistent incubation period or lack of key contact history). In team collaboration scenarios, informational cascades and conformity pressure may cause an individual nurse's reasonable suspicion to be submerged by group consensus, particularly when facing authoritative opinions or ambiguous situations. The combined effect of these biases poses an especially high risk when assessing patients with atypical presentations or those in the early window period of a disease. This may lead to delayed identification of emerging infectious diseases or result in excessive precautions for common illnesses, thereby undermining the predictive value of triage screening and the optimal allocation of isolation resources.

3.2 The Potential Role and Limitations of Triage Decision Support Tools

Electronic triage decision support systems represent a significant effort to standardize and assist clinical judgment through technological means. Their core logic lies in transforming evidence-based guidelines, expert consensus, and epidemiological data into computable algorithmic models. They guide nurses to complete the collection of key information via structured data entry interfaces and output rule-based risk stratification suggestions. The primary value of such tools is in enhancing the standardization and auditability of the triage process, reducing omissions in information collection caused by individual knowledge gaps or attention fluctuations, and establishing a baseline for decision consistency among nurses across different shifts and with varying levels of experience. More advanced

systems can integrate real-time laboratory alerts, regional infectious disease surveillance data, and patients' historical medical records to perform fusion analysis of multidimensional information. This enables the identification of abnormal clustering signals or individual patient-specific risk profiles that are difficult to detect manually[5].

However, the effectiveness of decision support tools in application is constrained by multiple intrinsic and contextual factors. The performance of their algorithms is fundamentally constrained by the quality and completeness of the input data, adhering to the iron law of "garbage in, garbage out." The infinite complexity of clinical reality often exceeds the boundaries of pre-set rules. The tool's assessment of patients with comorbidities, atypical symptoms, or special sociocultural backgrounds may lack necessary flexibility, leading to conflicts between its recommendations and clinical intuition based on a holistic and contextually understood perspective. Long-term over-reliance may trigger two negative effects: first, the "deskilling" of nurses' core differential diagnostic abilities; second, "alert fatigue" caused by overly frequent alarms or alerts that severely contradict clinical judgment, ultimately resulting in the habitual dismissal of valuable prompts. Therefore, the ideal design philosophy for such tools should adhere to the principle of "augmented intelligence" rather than "replacement intelligence," striving to construct a human-machine collaborative interface that is transparent, explainable, and allows for clinical override. The tool should be positioned as a "copilot" providing evidence-based references and risk alerts, rather than an "autopilot system" issuing mandatory commands.

3.3 Pathways for Enhancing Decision Quality through Feedback Loops and Reflective Practice

The systematic improvement of triage decision quality depends on shifting from incidental experience accumulation to institutionalized organizational learning. This hinges on establishing a closed-loop feedback mechanism that is precise, timely, and educational. An effective feedback system not only tracks the patient's final diagnosis and outcome but also requires meticulous attribution analysis. It must analyze the root causes of discrepancies between the initial triage judgment and the final outcome: whether it was due to missing key epidemiological history inquiries, misjudging the weight of specific symptom combinations, or being unduly influenced by resource pressures at the time. Without this closed-loop feedback, clinical experience remains merely the repetition of isolated events rather than the calibration and optimization of underlying decision-making logic, which allows erroneous assumptions within the cognitive model to persist[6].

Transforming feedback information into behavioral change requires reliance on a structured mechanism of reflective practice. This goes beyond simple case discussions; it is a guided form of metacognitive training focused on the cognitive process itself. For instance, in multidisciplinary debriefing sessions for difficult triage cases or adverse events, the facilitator should focus on reconstructing the situational pressures, the available information set, and the nurse's chain of reasoning at the time of the decision. Key discussion points should include: "Why was this possibility considered the most likely at the time?", "Which pieces of information were assigned decisive weight?", and "Were there any contradictory pieces of evidence that were overlooked?". By making implicit, automated judgment processes explicit and subjecting them to critical scrutiny, nurses can identify potential patterns of heuristics and biases within themselves and the team. The aim of this continuous reflective practice is to cultivate a vigilant habit of "slow thinking," enabling nurses to proactively engage analytical thinking to test intuitive judgments when faced with complex situations. This facilitates an evolution in decision-making patterns from reliance on inertial "repetition of experience" to "professional refinement" that emphasizes evidence and critical reasoning, ultimately enhancing the adaptability and resilience of the entire triage system when confronting unknown or variant pathogens.

Conclusion

This study, through integrative analysis, reveals that the triage decisions made by emergency department nurses for patients with suspected infectious diseases are a complex outcome shaped by multidimensional factors. The quality of these decisions is primarily determined by the nurse's individual cognitive structure and level of professional knowledge, which govern the accuracy of their risk assessment prototypes and their ability to adapt guidelines within clinical contexts. Simultaneously, the decisions are firmly anchored within specific clinical situations; the ambiguity of patient information, the dynamic workload of the emergency environment, and the immediate availability of critical resources collectively form the objective boundaries and constraints of decision-making. Furthermore, a persistent tension exists between the automated heuristic judgments and inherent

cognitive biases present in the decision-making process and the decision support tools designed to achieve standardization and consistency. Based on this, future optimization efforts should focus on constructing a dynamic, systematic learning-oriented intervention framework. This includes developing targeted training aimed at identifying and correcting cognitive biases, designing more intelligent, interpretable, and clinically workflow-integrated human-machine collaborative decision aids, and establishing an institutionalized community of reflective practice based on case feedback. Through these mechanisms, triage decision-making can continuously evolve from an art highly dependent on individual experience into a professional practice characterized by scientific rigor, adaptability, and robustness, thereby more effectively safeguarding emergency care safety and the public health defense line.

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