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Research Article

Emergency Management of Patients with Hereditary Angioedema: Collaborative Roles of Nurses and Pharmacists

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Abstract:

The emergency management of patients with hereditary angioedema (HAE) represents a critical clinical scenario where timely, targeted intervention is essential to prevent morbidity and mortality, particularly from life-threatening laryngeal edema. This process relies fundamentally on a synergistic, interdisciplinary collaboration between nurses and pharmacists within the emergency department. Nurses provide frontline vigilance through rapid assessment, continuous monitoring for airway compromise, and administration of specific therapies, while pharmacists ensure the immediate availability, accurate preparation, and safe dispensing of complex, often costly, HAE-specific medications. Their integrated roles—spanning diagnostic support, acute pharmacological management, supportive care, and patient education—streamline the emergency response, reduce time-to-treatment, and minimize errors. This collaborative model not only optimizes outcomes during acute attacks but also facilitates a seamless transition to long-term care, underscoring the necessity of a structured, team-based

approach in managing this rare and unpredictable disorder.

1. Introduction

Hereditary angioedema (HAE) is a rare, autosomal dominant genetic disorder characterized by recurrent, unpredictable episodes of severe swelling involving the skin, gastrointestinal tract, and upper airways. The condition, with an estimated prevalence of 1 in 50,000 individuals globally, poses significant diagnostic and therapeutic challenges, particularly in emergency settings where rapid intervention can be life-saving [1]. HAE results from a deficiency or dysfunction of C1 esterase inhibitor (C1-INH), a key regulator of the complement, kallikrein-kinin, and fibrinolytic systems. This deficiency leads to uncontrolled activation of plasma kallikrein, subsequent overproduction of bradykinin, and increased vascular permeability, which is the primary mediator of angioedema attacks [2]. Clinically, HAE manifests as episodes of non-pitting, non-pruritic edema that can affect the extremities, face, genitals, and abdomen. Abdominal attacks, often mimicking surgical emergencies, are characterized by severe pain, nausea, vomiting, and ascites, while laryngeal edema represents the most feared complication due to the risk of rapid asphyxiation and death if not treated promptly [3].

The emergency management of HAE is a critical area of focus, as delays in diagnosis or inappropriate treatment can lead to catastrophic outcomes. Historically, mortality rates from laryngeal edema were as high as 30%, but with the advent of targeted therapies and standardized emergency protocols, this has decreased significantly [4]. However, the rarity of HAE means that many emergency department (ED) personnel may lack familiarity with its presentation, leading to misdiagnosis as allergic angioedema, which is histamine-mediated and treated with antihistamines, corticosteroids, and epinephrine—therapies ineffective and potentially delaying specific treatment for bradykinin-mediated HAE attacks [5]. This underscores the imperative for a well-coordinated, multidisciplinary approach in the emergency care continuum, where nurses and pharmacists play pivotal and collaborative roles.

Nurses, as frontline caregivers in emergency departments, are often the first to assess patients presenting with angioedema. Their roles encompass rapid triage, initial clinical assessment, vigilant monitoring for airway compromise, administration of emergency medications, and providing patient education and psychological support during distressing attacks. The nurse's clinical judgment in recognizing the hallmark features of HAE—such as the absence of urticaria, a positive family history, and the failure to respond to conventional allergic reaction treatments—is crucial for triggering the appropriate diagnostic and therapeutic pathways [6]. Furthermore, nurses coordinate care, facilitate communication among team members, and ensure that emergency protocols specific to HAE are executed efficiently, thereby reducing time-to-treatment, a critical factor in patient outcomes.

Pharmacists, equally integral to the emergency team, contribute specialized expertise in pharmacology, pharmacotherapy, and medication safety. In the context of HAE, this involves ensuring the immediate availability and appropriate preparation of specific, often costly, plasma-derived or recombinant therapies. Pharmacists are responsible for verifying orders, checking for contraindications, managing inventory of these specialized agents, and providing crucial information on dosing, administration routes, and potential adverse effects. Their role extends to counseling healthcare staff on the proper use of these medications and collaborating with nurses to ensure safe and timely administration [7]. Moreover, pharmacists often engage in therapeutic interchange protocols and manage access issues related to these orphan drugs, which is vital in a time-sensitive emergency scenario [8].

2Emergency Presentation and Initial . Assessment: The Frontline Vigilance

The emergency department encounter for a patient with Hereditary Angioedema begins with presentation, which can vary widely in severity and location of swelling. Nurses, serving as the first point of contact, perform the critical initial assessment that sets the trajectory for care. This assessment must rapidly distinguish HAE from other forms of angioedema, particularly allergic angioedema or angioedema induced by angiotensin-converting enzyme (ACE) inhibitors. Key nursing responsibilities include conducting a focused history and physical examination. The history should inquire about the onset and progression of swelling, previous similar episodes, family history of angioedema or unexplained sudden death, current medications, and any known triggers such as trauma, stress, dental procedures, or infections [9]. Physical assessment involves meticulous evaluation of the airway, breathing, and circulation, with particular attention to signs of laryngeal involvement like voice changes, stridor, dysphagia, or respiratory distress. Assessment of abdominal attacks requires palpation for tenderness and

guarding, while noting any signs of hypovolemia due to fluid shift into the intestinal wall [10].

Pharmacists contribute to this phase indirectly by ensuring that the ED is equipped with diagnostic aids and by being available for consultation. However, their direct role amplifies once a suspicion of HAE is raised. Pharmacists can assist in reviewing the patient's medication history to rule out drug-induced angioedema, a common mimic, especially from ACE inhibitors. They can also provide immediate information on the availability and location of specific HAE medications within the hospital formulary and emergency stocks. This proactive involvement helps shorten the time between diagnosis and treatment initiation. Collaboration is evident when nurses relay assessment findings to the physician and pharmacist, enabling a rapid collective decision on the need for specific therapy. Studies show that EDs with established protocols involving early pharmacist consultation for suspected HAE have reduced time to administration of first-dose therapy [11]. This integrated approach ensures that the patient moves swiftly through the triage and assessment phase into active treatment.

3. Diagnostic Challenges and Collaborative Pathways to Confirmation

Diagnosing HAE in an emergency setting is fraught with challenges due to its rarity and symptom overlap with more common conditions. While definitive diagnosis typically involves laboratory confirmation of low C4 levels and quantitative/functional C1-INH testing, these results are not immediately available during an acute attack. Therefore, emergency management often must proceed based on clinical suspicion and patient history. Nurses play a vital role in gathering this diagnostic information. They are positioned to obtain detailed patient and family histories that may reveal an autosomal dominant pattern. They also document the characteristic features of the swelling—its lack of pruritus or urticaria, its slow progression over hours, and its typical duration of 48 to 72 hours if untreated [12]. This documentation is crucial for the treating physician and for subsequent specialist referral.

Pharmacists support the diagnostic process by aiding in the differential diagnosis through medication review and by understanding the pharmacokinetic and pharmacodynamic profiles of HAE therapies. Their knowledge helps reinforce why traditional allergy medications are ineffective, thereby steering the team away from diagnostic and therapeutic pitfalls. In some institutions, pharmacists are involved in ordering or facilitating rapid laboratory tests, though this role varies. More consistently, they contribute by managing the supply of diagnostic kits or point-of-care tests, if available, for C1-INH function. The collaborative diagnostic pathway involves nurses collecting clinical data, pharmacists providing pharmacotherapeutic insights, and both communicating these findings to the physician to form a cohesive clinical picture. This teamwork is essential to avoid misdiagnosis, which can lead to unnecessary procedures, such as laparotomy for abdominal attacks, or fatal delays in treating laryngeal edema [13]. The integration of nursing and pharmacy expertise creates a safety net that enhances diagnostic accuracy in the high-pressure ED environment.

4. Pharmacological Management in the Acute Attack: Precision and Timeliness

The cornerstone of emergency management for an acute HAE attack is the prompt administration of targeted therapies aimed at inhibiting bradykinin formation or activity. The available agents include plasma-derived C1-INH concentrates (pdC1-INH), recombinant C1-INH (conestat alfa), the bradykinin B2 receptor antagonist icatibant, and the plasma kallikrein inhibitor ecallantide. The choice of agent depends on factors like availability, patient history, site of attack, and regulatory approvals. Nurses and pharmacists must work in tight collaboration to ensure these therapies are delivered safely and effectively. The nurse's role involves preparing the patient for administration, which may include intravenous (IV) access for pdC1-INH or recombinant C1-INH, or subcutaneous injection for icatibant. They monitor for immediate adverse reactions, such as anaphylaxis (though rare with current products) or injection site reactions, and assess therapeutic response [14].

The pharmacist's role in acute pharmacological management is multifaceted and critical. Upon receiving an order for an HAE-specific agent, the pharmacist verifies the appropriateness of the dose and route based on the patient's weight, attack severity, and any previous treatments. They then expedite the preparation and dispensing of the medication. For IV products like pdC1-INH, pharmacists ensure proper reconstitution, check for solubility, and confirm the infusion plan. They provide nurses with clear instructions on administration rates and compatibility. For subcutaneous agents like icatibant, pharmacists may prepare the syringe or verify the auto-injector is used correctly. Given the high cost and limited availability of these drugs, pharmacists also manage inventory, secure required medications from

pharmacy stocks or through emergency access programs, and handle any necessary paperwork for authorization, which is especially important in time-sensitive situations [15].

This collaboration is exemplified in the administration of ecallantide, which requires subcutaneous injection but carries a boxed warning for anaphylaxis. Here, the pharmacist ensures the drug is dispensed with appropriate monitoring equipment and pre-medications if needed, while the nurse administers the drug in a setting equipped to manage anaphylaxis and observes the patient closely for at least an hour post-injection. Their shared communication ensures that both are aware of the patient's status and any emergent reactions. Research indicates that protocols co-developed by nursing and pharmacy staff for the standardized preparation and administration of HAE therapies reduce medication errors and decrease time from order to administration, directly improving patient outcomes in acute attacks [16]. This synergistic partnership ensures that the right drug reaches the right patient at the right time, which is paramount in preventing morbidity and mortality.

5. Non-Pharmacological Interventions and Comprehensive Supportive Care

While specific pharmacotherapy is the mainstay for arresting an HAE attack, non-pharmacological interventions and supportive care are essential components of emergency management, primarily led by nursing staff with support from pharmacy. For any HAE attack, but particularly for abdominal or laryngeal episodes, supportive care aims to maintain patient comfort, ensure safety, and prevent complications. In abdominal attacks, nurses manage severe pain, which often requires opioid analgesics. They monitor for signs of dehydration or electrolyte imbalances due to vomiting or fluid sequestration, administering IV fluids as ordered. Nasogastric tube placement may be considered for decompression in severe cases. For laryngeal attacks, continuous monitoring of airway patency is paramount. Nurses are trained to recognize early signs of respiratory compromise and are prepared to assist with advanced airway management, including intubation or, in extreme cases, tracheostomy, should pharmacological treatment not suffice or be delayed [17].

Pharmacists contribute to supportive care by managing medication-related aspects. They advise on appropriate analgesic regimens, considering drug interactions and the patient's overall condition. For instance, they might caution against the use of ACE inhibitors or estrogen-containing medications that could exacerbate HAE. Pharmacists also ensure that medications for nausea, vomiting, or anxiety are available and appropriately dosed. In the context of fluid management, pharmacists can advise on the composition of IV fluids to correct specific electrolyte abnormalities. Their role extends to reviewing all medications administered during the ED stay to avoid iatrogenic triggers or interactions with HAE-specific therapies. This collaborative supportive care approach ensures that while the primary attack is being treated pharmacologically, the patient's overall physiological and psychological needs are addressed holistically [18]. The nurse-pharmacist team works to create a care environment that minimizes stress—a known trigger for HAE—through effective communication and compassionate care.

6. Interdisciplinary Communication and Team Dynamics in the ED

Effective emergency management of HAE is inherently dependent on seamless interdisciplinary communication and well-defined team dynamics. The ED team typically includes emergency physicians, nurses, pharmacists, respiratory therapists, and sometimes hematologists or immunologists consulted remotely or on-call. Nurses and pharmacists serve as the operational nexus in this team. Nurses, through constant bedside presence, relay real-time patient status updates, including changes in swelling, pain levels, or respiratory function. They communicate these observations to both the physician and pharmacist, ensuring all team members have a current clinical picture. Pharmacists, often stationed in the ED or available via phone, provide updates on medication availability, preparation status, and any pharmacotherapeutic concerns [19].

Structured communication tools, such as SBAR (Situation, Background, Assessment, Recommendation), are particularly useful in this context. For example, a nurse might use SBAR to inform the pharmacist: "Situation: Patient with known HAE has worsening lip and tongue swelling over the past hour. Background: History of laryngeal attacks, last dose of icatibant 6 months ago. Assessment: Voice is slightly hoarse, no stridor yet, oxygen saturation 96% on room air. Recommendation: I recommend we prepare icatibant for immediate administration per protocol." The pharmacist would acknowledge, confirm drug availability, and estimate time to delivery. This clear communication prevents misunderstandings and delays. Furthermore, nurses and pharmacists often participate in joint briefings before shift changes or during critical events to

ensure continuity of care. Studies on ED teamwork highlight that when nurses and pharmacists engage in collaborative rounds and shared decision-making, patient safety incidents decrease, and adherence to clinical guidelines improves [20]. In HAE management, where minutes count, this optimized teamwork can be the difference between a resolved attack and a catastrophic airway event.

7. Patient and Family Education for Emergency Preparedness

Education is a powerful tool in managing HAE, and in the emergency context, it focuses on preparedness for future attacks and appropriate ED utilization. Nurses and pharmacists share responsibilities in educating patients and their families during or immediately after an emergency visit. For the patient presenting with an attack, education begins in the ED once the acute situation is stabilized. Nurses provide instruction on recognizing early symptoms of an attack, especially laryngeal warning signs, and emphasize the importance of seeking emergency care immediately. They teach patients and families how to use on-demand medications if prescribed for home use, such as subcutaneous C1-INH or icatibant auto-injectors. Nurses often arrange for return demonstrations to ensure competency [21].

Pharmacists complement this education by providing detailed information about the medications, including storage requirements, expiration dates, reconstitution techniques if applicable, and potential side effects. They discuss the importance of having a supply of medication available at all times and traveling with it. Pharmacists also educate on avoiding known triggers, such as certain medications (e.g., ACE inhibitors, estrogen therapies), and managing stress. Furthermore, they assist in facilitating access to these medications by providing information on patient assistance programs or specialty pharmacies. Collaborative education between nurse and pharmacist ensures consistency of information and addresses both clinical and practical concerns. This dual approach reduces anxiety, empowers patients for self-management, and can prevent unnecessary ED visits for minor attacks that can be managed at home, while ensuring timely presentation for severe symptoms [22]. The ultimate goal is to create a personalized emergency action plan that the patient, family, and local ED can follow, a plan often developed with input from both nursing and pharmacy professionals.

Transition from Emergency to Long-term Management: Ensuring Continuity of Care

The emergency department encounter for an HAE attack is a critical intervention point, but it must be seamlessly connected to long-term management to prevent future attacks and reduce ED reliance. Nurses and pharmacists play pivotal roles in this transition. Before discharge, nurses coordinate follow-up appointments with specialists, such as allergists, immunologists, or hematologists. They ensure the patient has a clear understanding of when to use on-demand therapy versus when to proceed to the ED. Nurses also assess the patient's support system and home environment to identify any barriers to effective long-term management [23].

Pharmacists conduct medication reconciliation, a crucial step to avoid drug interactions or triggers in the outpatient setting. They provide a comprehensive list of medications to avoid and furnish a detailed discharge summary of the emergency medications administered. Pharmacists may also liaise with outpatient pharmacies or specialty pharmacies to ensure the patient has access to necessary prophylactic or on-demand medications upon discharge. In some healthcare systems, clinical pharmacists embedded in transition-of-care programs contact patients after ED discharge to reinforce education, assess medication adherence, and troubleshoot access issues [24]. This collaborative transition effort reduces the risk of readmission and helps stabilize the patient's condition. By bridging the gap between emergency and chronic care, nurses and pharmacists contribute significantly to improving the overall quality of life for HAE patients and reducing the burden on emergency services.

8. Challenges and Barriers in Emergency Management: Systemic and Professional Hurdles

Despite advances in therapy, significant challenges persist in the emergency management of HAE. These include lack of disease awareness among ED staff, high cost and limited availability of specific medications, diagnostic delays, and variability in institutional protocols. Nurses often face the challenge of advocating for a rare disease in a busy ED where HAE may not be a priority. They may encounter physicians unfamiliar with HAE who are hesitant to administer expensive, specialized therapies without specialist consultation, causing treatment delays. Pharmacists grapple with inventory management of high-cost drugs that have limited shelf lives and may not be routinely stocked in all EDs. They also face administrative hurdles in obtaining rapid insurance authorization for these

medications in an emergency, where time is critical [25].

Collaboration between nurses and pharmacists can help overcome these barriers. Together, they can champion the development and implementation of standardized ED protocols for HAE, which include standing orders for specific therapies based on clinical presentation. They can jointly conduct in-service training for ED staff to raise awareness. Pharmacists can work with hospital administrators to secure reliable access to HAE medications, perhaps through consignment stocks or rapid procurement systems. Nurses can use standardized assessment tools to quickly identify potential HAE cases, triggering protocol activation. Research indicates that institutions with a collaborative nursing-pharmacy team dedicated to improving rare disease management have more efficient processes and better patient outcomes [26]. Addressing these challenges requires persistent advocacy and teamwork, underscoring the importance of the nurse-pharmacist partnership in systemic improvement.

9. Future Directions and Recommendations for Enhanced Collaboration

The future of emergency management for HAE lies in leveraging technology, refining protocols, and deepening interdisciplinary collaboration. Telemedicine can facilitate immediate specialist consultation during an ED visit, with nurses and pharmacists presenting the case. Electronic health record (EHR) integrations, such as best practice alerts for patients with a history of HAE or for those presenting with angioedema symptoms, can prompt appropriate ordering and medication access. Nurses and pharmacists can jointly develop and maintain these EHR tools. Furthermore, simulation training involving both nursing and pharmacy staff can improve preparedness for rare but high-stakes HAE emergencies [27].

Recommendations for practice include establishing formalized HAE response teams within EDs that include designated nurses and pharmacists trained in HAE management. These teams would be responsible for protocol maintenance, staff education, and quality assurance. Another recommendation is for pharmacists to have expanded roles in point-of-care testing for C1-INH levels, where feasible, to expedite diagnosis. Additionally, fostering stronger partnerships with patient advocacy groups can provide resources and real-world insights to improve ED care pathways. Research should focus on measuring outcomes related to nurse-pharmacist collaborative interventions, such as time-to-treatment, patient satisfaction, and cost-effectiveness [28]. By embracing these future directions, the emergency care community can build a more resilient and responsive system for patients with HAE.

10. Conclusion

The emergency management of patients with Hereditary Angioedema is a complex, high-stakes medical scenario that demands precision, speed, and specialized knowledge. Within this framework, nurses and pharmacists emerge as indispensable collaborators, each bringing unique expertise that, when integrated, significantly enhances patient outcomes. From initial assessment and diagnostic support through the timely administration of life-saving therapies and comprehensive supportive care, their roles are complementary and synergistic. Effective communication and teamwork between these professionals streamline processes, reduce errors, and ensure that care is both patient-centered and evidence-based. As challenges related to disease rarity and resource constraints persist, the continued evolution of the nurse-pharmacist partnership, supported by standardized protocols, education, and technological aids, holds the promise of further improving the emergency response to HAE attacks. Ultimately, this collaborative model not only addresses the acute episode but also strengthens the bridge to long-term management, embodying a holistic approach to caring for individuals with this chronic, unpredictable condition.

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