



# Adverse Events During Transitions of Care from the Emergency Department to the Inpatient Setting

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## INTRODUCTION

Medical and public health professionals are acutely aware of the significant public health concerns posed by adverse events (AE) during transitions of care.<sup>1</sup> AEs are injuries caused by medical care and not injuries caused by the underlying disease of patients. These injuries result during care transitions from several factors, such as incomplete communication transfers between clinicians and patients who are not adequately prepared during their physician visits, and clinicians who assume responsibility for patient care during the continuum of care.<sup>2,3</sup> The consequences of these AEs can be severe, leading to increased morbidity, healthcare utilisation, functional decline, poor patient experiences, and heightened caregiver burden.<sup>4</sup>

## DISCONTINUITIES IN CARE

The causes of AEs during transitions of care often trace back to discontinuities in care.<sup>2</sup> These gaps in care emerge with complex healthcare systems that involve multiple professionals.<sup>5</sup> The interrelationship of healthcare activities and the intricacy within these systems amplify the risk for error, especially when several and

expedient handoffs become a necessity.<sup>6</sup> These issues are pervasive across the care continuum, manifesting between inpatient and outpatient pharmacies, during physician discharge summaries, cross-coverage sign-outs, discharge planning, and follow-up for abnormal laboratory test results.<sup>7,8</sup>

## ADVERSE EVENTS DURING TRANSITIONS OF CARE

Studies conducted in North America have investigated AEs in patients discharged from the internal medicine service of hospitals in urban areas with strong academic affiliations,<sup>9,10</sup> and patients discharged from an internal medicine service run by hospital physicians of a community hospital.<sup>4</sup> These studies have found an AE rate of 19–28%<sup>4,9,10</sup> in patients with about 33% of the AEs classified as being preventable (meaning that an injury may have the potential of being prevented if the error or system design flaw had not taken place), and about 33% classified as being ameliorable (meaning that an injury whose seriousness or length of time could have been potentially decreased if the clinician had followed different actions or procedures).<sup>4,9,10</sup> Within 4 weeks after hospital discharge, approximately 9–21% of subjects had an unscheduled visit to a

physician's office, 11–33% of subjects visited the emergency department (ED), and 17–24% were readmitted to the hospital.<sup>4,9,10</sup> Adverse drug events (ADE) were the most common type of transition of care AEs, accounting for 66–72%. Other AEs included medical procedures (7–17%); therapeutic errors, e.g., during the medication delivery process (4–16%); management errors (14%); hospital-acquired infections (1–11%); and diagnostic errors (3–6%).<sup>4,9,10</sup> Approximately 66% of subjects had symptoms resulting from an AE for over a week, while about 33% of subjects experienced a life-threatening injury, and 3% of subjects died from the injury.<sup>4,9,10</sup> After a patient is discharged from the ED to home, the incidence rate of AEs is approximately 6%.<sup>11</sup> These AEs frequently include diagnostic errors (25.0–28.3%), management errors (29–30.2%), and ADEs (20.8%).<sup>11</sup> The majority of ED-originated AEs are preventable (56.6–71.0%) and serious.<sup>11</sup> Other studies have reported similar preventability of ED AEs ranging from 36–71%, and found that the majority of AEs were related to ADEs and diagnostic errors.<sup>12</sup>

AEs occurring during the transition from the ED to the inpatient setting are less explored. A European study examined AEs during this transition of care, focusing solely on diagnostic errors, reporting an incidence rate of over 12%.<sup>13</sup> Additionally, a recent study from the USA focused on all types of AEs and found that the incidence rate of AEs is over 22%, with ADEs (42%) identified as the most common AE, followed by management (38%), and diagnostic errors (21%).<sup>14</sup> From these AEs, 75% were considered preventable and 33% considered serious in severity. Patients with a considerable length of time in the ED had an increased risk for an AE.<sup>14</sup> An example of an AE from the ED to the inpatient setting includes a patient receiving an antibiotic in the ED and experiencing diarrhoea after transfer to the inpatient setting. The patient had prior documentation of experiencing diarrhoea with this particular antibiotic from a previous admission; therefore, the AE was judged to be preventable. If prior documentation did not exist, the AE would have been non-preventable.

## UNIQUE CONTRIBUTORS TO ADVERSE EVENTS FROM THE EMERGENCY DEPARTMENT TO THE INPATIENT SETTING

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There may be unique contributors to discontinuities and AEs from the ED to the hospital wards, including: 1) overcrowding in the ED places clinicians under intense pressure to move patients to hospital wards, and this pressure may result in deficient diagnostic examinations and may lead to sending patients to the wrong service;<sup>15</sup> 2) shift changes are critical in the ED and clinicians receiving patients from their colleagues who left for the day may be unfamiliar with and have to send these patients for care to inpatient clinicians (inadequate intra-ED transitions);<sup>15</sup> 3) clinicians may have less time to understand a patient's diagnostic examinations when they have to see a large volume of patients in the ED;<sup>15</sup> 4) concerns among the ED clinicians who wish to decrease a patient's boarding time and inpatient clinicians who wish to reserve their right to decide if a patient should be admitted to their service and the right to block a patient's admission or redirect to a different service;<sup>15</sup> 5) ED and inpatient clinicians with various levels of training and backgrounds; 6) patient information that is transferred lacks standardisation; and 7) boarding issues regarding who is in charge of a patient's care, a patient's physical proximity with the inpatient care team, and miscommunication between the ED nurse and inpatient care team may lead to delays in a patient's treatment plan and increase the risk for the occurrence of medical errors.<sup>16</sup> As a result, these discontinuities may lead to mis-triage,<sup>15</sup> deficient information being transferred,<sup>15</sup> unexpected outcomes such as pending test results from the ED coming back positive in the inpatient setting,<sup>16</sup> the deterioration of a patient's condition during the transition from the ED to the inpatient setting,<sup>15</sup> and insufficient care when a patient is boarding in the ED.<sup>15</sup>

## STANDARDISED COMMUNICATION TOOLS TO IMPROVE INFORMATION TRANSFER FROM THE EMERGENCY DEPARTMENT TO THE INPATIENT SETTING

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Poor communication between clinicians has been linked to patient hand-offs that may result in any healthcare setting. For example, hand-offs may occur when the ED physician signs off patients to the hospitalist physician without a standardised hand-off tool. These hand-offs are responsible for 80% of medical errors and two-thirds of sentinel events (unplanned events causing death, serious physical injury, psychological harm, or related risks).<sup>17</sup> Thus, utilising a standardised communication tool to improve information from the ED to the inpatient setting is essential. A recently developed communication tool includes IPASS (Illness Severity, Patient Summary, Actions List, Situation Awareness and Contingency, and Synthesis by the Receiver) and is responsible for an estimated 23% reduction in medical errors and a 30% reduction in preventable adverse events.<sup>18</sup>

Additional communication tools include SBAR (Situation, Background, Assessment, and Recommendation) that has been utilised both intraprofessionally and interprofessionally.<sup>19</sup> Interprofessional communication among physicians, nurses, pharmacists, and social workers, to name a few, is considered vital in the delivery of optimal care and has evolved from the patient safety movement. The benefit of SBAR is that it may be utilised across several disciplines, requiring clinicians to provide all relevant information by increasing understanding and awareness of the situation.<sup>20</sup> This tool has been shown to increase patient safety and is regarded as best practice for communicating critical information among clinicians.<sup>21</sup> Thus, both communication tools mentioned above may be adopted to improve information transfer between the ED and hospitalist physicians.

## INTERVENTIONS TO REDUCE ADVERSE EVENTS FROM THE EMERGENCY DEPARTMENT TO THE INPATIENT SETTING

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To address these challenges, specific interventions are proposed for the transition from the ED to the inpatient setting. Trained pharmacist interventions that included medication reconciliation, inpatient pharmacist counselling, low-literacy adherence aids, and tailored telephone follow-up after hospital discharge have been proven effective in reducing AEs during transitions of care, especially from the hospital to home.<sup>22</sup> Patients benefit from a tailored intervention that will increase their knowledge of the medications they have been prescribed.<sup>23</sup> Patients with low literacy benefit significantly from educational interventions that are provided by pharmacists.<sup>24</sup> A pharmacist follow-up within 72 hours after hospital discharge has been proven effective in capturing problems such as filling prescriptions, side effects, and a patient's understanding of the regimen.<sup>25</sup> Similar interventions may benefit patients in reducing AEs from the ED to the inpatient setting. Although a pharmacist intervention may require additional resources and costs for implementation in a healthcare setting, the benefit for patients may be tremendous in reducing the likelihood of an AE and a potential ED visit and/or hospital readmission.

Machine learning has the potential benefits of predicting AEs in patients during transitions of care. A recent study utilised a machine learning intervention to accurately identify patients with acute coronary syndrome.<sup>26</sup> This machine learning approach was feasible and effective and may be useful in guiding clinical decision-making during transitions of care.

AI also has enormous potential in the prediction and early detection of ADEs in particular. A systematic review found that the majority of studies developed predictive algorithms and utilised a wide range of AI approaches that were focused on ADEs.<sup>27</sup> This review indicated that additional studies of specific models are needed to find the most successful AI methods to detect ADEs.

For example, the performance of AI-based algorithms may be improved by integrating unstructured clinical notes into electronic health record data.<sup>27</sup> Thus, AI is a promising approach to reducing the frequency of ADEs.

## CONCLUSION

In summary, AEs during transitions of care from the ED to the inpatient setting represent a significant public health concern, often stemming from discontinuities in complex healthcare systems. To mitigate these issues, targeted communication tools and interventions involving pharmacists, machine learning, and AI can be implemented. These measures aim to improve patient safety and reduce AEs.

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