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Information handoff and outcomes of critically ill patients transferred between hospitals☆,☆☆

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ABSTRACT

Purpose: Patients transferred between hospitals are at high risk of adverse events and mortality. This study aims to identify which components of the transfer handoff process are important predictors of adverse events and mortality.
Materials and methods: We conducted a retrospective, observational study of 335 consecutive patient transfers to 3 intensive care units at an academic tertiary referral center. We assessed the relationship between handoff documentation completeness and patient outcomes. The primary outcome was in-hospital mortality. Secondary outcomes included adverse events, duplication of labor, disposition error, and length of stay.
Results: Transfer documentation was frequently absent with overall completeness of 58.3%. Adverse events occurred in 42% of patients within 24 hours of arrival, with an overall in-hospital mortality of 17.3%. Higher documentation completeness was associated with reduced in-hospital mortality (odds ratio [OR], 0.07; 95% confidence interval [CI], 0.02 to 0.38; $P = .002$), reduced adverse events (coefficient, −2.08; 95% CI, −2.76 to −1.390; $P < .001$), and reduced duplication of labor (OR, 0.19; 95% CI, 0.04 to 0.88; $P = .033$) when controlling for severity of illness.
Conclusions: Documentation completeness is associated with improved outcomes and resource utilization in patients transferred between hospitals.

1. Introduction

Transitions of care, whether between institutions or within, are frequent sources of medical errors, inefficiency, and unnecessary costs [1-4]. The root cause of adverse events associated with transitions of care is poor transfer of information between providers [5]. Multiple studies demonstrate that improving communication to provide coordinated care during transition can result in more cost-efficient care, reduced rate of errors and near misses, and improved patient satisfaction [6-9].

An understudied area within the transitions of care literature is interhospital transfers. Multiple barriers such as bed availability, transportation coordination, and establishing an accepting physician create uncertainty in the transfer process and can delay care [7,10-14]. Moreover, patients who are transferred to tertiary referral centers are heterogeneous, often with complex comorbidities and unique diagnoses. Characterizing this group on a population level and comparing them with a nontransferred population is challenging [15,16].

Only a handful of studies have investigated the process of transferring patients between hospitals and its impact on clinical outcomes [17,18]. The field has largely focused on areas in which point-of-care risk stratification is simple; ST-segment elevation myocardial infarctions and high-risk traumas can be triaged to tertiary care centers via regional protocols [19-22]. These diagnoses constitute only a fraction of indications for interhospital transfers. Despite established practices, delays are frequent and often related to unnecessary testing, uncertain diagnoses, and imperfect adherence to guidelines [12,23-26].

When decision making is complex, patients are diverse, and hospital staffing patterns are variable, creating a transfer protocol to encompass all scenarios is not practical. Even while utilizing specialized retrieval teams (eg, mobile intensive care units [ICUs]) to facilitate movement of critically ill patients, communication errors are commonplace [18,27,28]. The Emergency Medical Treatment and Labor Act demonstrates the importance of stabilizing patients before transfer; however, its protections do not apply to patients who decompensate after admission [29].

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Ideal handoffs consist of both a verbal and written exchange between providers. Creating protocols for this exchange using programs such as illness severity, patient summary, action list, situation awareness, synthesis by receiver, which optimized handoffs during shift changes, has demonstrated a reduction in medical errors [30]. However, a recent survey of intensivists found that only 13% have standardized handoff processes in place, and many reported adverse events related to poor information exchange during handoffs [31]. In a large study of transfer centers, interhospital handoff processes varied widely. A verbal handoff was often recorded between providers, but concurrent documentation was rarely required [32].

Integrating clinical documentation and objective data is an important facet of high-quality care coordination [33]; however, the role of complete documentation in transitions of care remains understudied. Documentation completion has been associated with improved data availability [34], improved adherence to guidelines [35], and improved patient satisfaction [36]; however, its full impact on inpatient care delivery and subsequent outcomes remains unclear [37].

In a health care environment with a new focus on care coordination to prevent diagnostic and medical error, we attempted to systematically evaluate the process of patient handoffs between hospitals to identify unique predictors of risk and important areas for improvement. This pilot study analyzed 335 consecutive patients transferred to a single academic tertiary care hospital. A novel tool was developed to objectively describe and evaluate the information quality of interhospital transfer documentation. We then tested the hypotheses that documentation is an important aspect of a safe transfer, irrespective of the verbal handoff, and that comprehensive transfer documentation is associated with lower mortality, adverse events, and overutilization.

2. Methods

We conducted a retrospective observational study of patients transferred to 3 ICUs (medical ICU, surgical ICU [SICU], and cardiac care unit [CCU]) of the Robert Wood Johnson University Hospital (RWJUH). The RWJUH is a 610-bed tertiary academic medical center located in New Brunswick, NJ, and is the principal teaching hospital of Rutgers-Robert Wood Johnson Medical School. Consecutive transfers between December 1, 2011, and December 31, 2012, were identified through transfer center records. Inclusion criteria encompassed all patients directly transferred to a RWJUH ICU from outside hospital critical care units or emergency departments (EDs). Patients who were transferred via the RWJUH ED (an extra level of triage) were excluded from the study, as well as all patients less than the age of 18 years. The institutional review board at Rutgers-Robert Wood Johnson Medical School approved the protocol.

2.1. Transfer process

Patient transfer is initiated through the RWJUH transfer center, a unit with the sole purpose of identifying an appropriate accepting physician and coordinating the practical aspects of transport based on bed availability and patient's clinical status (Supplemental Fig. 1). A verbal handoff between physicians is subsequently facilitated by the transfer center at the time of acceptance and between nurses at the time of transfer. The transfer center also requests that a complete copy of the patient's chart is sent at the time of transfer.

2.2. Unit descriptions

The medical ICU is a 16-bed teaching ICU, with a high-intensity model of care. Both university and community physicians may be the attending of record, and an in-house overnight intensivist supervises resident- and Advanced Practice Nurse-led patient care. The CCU is a 14-bed teaching ICU, where resident care is supervised by a cardiology boarded university or community physician. The SICU is a 20-bed closed ICU in which a 24-hour in-house acute care surgeon supervises resident- and APN-led patient care.

2.3. Completeness of transfer documentation

Reviews of referring hospital records and outcomes were performed independently by 2 reviewers and results and merged only for averaging and subsequent statistical analysis to maintain blinding of the reviewer to patient outcomes. Each record was evaluated for the presence and completeness of a discharge summary, history and physical, laboratory values, images (including digital copies when important for patient care), consults, medication reconciliation, and progress notes. Each element was given a 0 for absent, 1 for incomplete, or 2 for complete, using strict criteria (Supplemental Data). Cohen κ was calculated from all documentation elements to assess for interrater reliability. Documentation completeness presented as a percentage of the total possible points, with a higher score representing the presence of more complete information.

As the percentage of document completeness represents an abstraction of multiple elements of documentation quality, we also performed a principal component analysis including each individual documentation element to develop a weighted transfer score. Two components with Eigenvalues greater than 1 were identified after orthogonal rotation: documentation completeness (progress note, laboratory values [labs], images, discharge summary, consults, and History and Physical, [H&P]) and transfer timing (progress notes, medication reconciliation, and consults), which were unlikely to be completed in a transfer from the ED or early in the hospitalization. Correlation matrix, variable loading, and unexplained variance are shown in Supplemental Tables I and II.

2.4. Outcomes and measures

The primary outcome was in-hospital mortality using logistic regression. Severity of illness was controlled using MPM_0-III, a validated measure based on age, laboratory values, vitals, and comorbidities on arrival that predict mortality [38]. Secondary outcomes were adverse events and duplication of labor. Adverse events reflected early escalations of care as a marker of instability within the first 24 hours of transfer, indicated by intubation, initiation of a new vasopressor, blood product transfusion, and initiation of renal replacement therapy.

We also investigated several measures of resource utilization including duplication of labor, disposition error, and length of stay. Duplication of labor was included as a measure of overutilization unique to patients transferred between facilities. This was defined as a dichotomous variable and considered present if there was clear evidence of repeat laboratory testing, imaging, or procedures without new medical indication. For example, a repeat cardiac catheterization in advance of open heart surgery, solely due to the unavailability of outside hospital catheterization films, would be identified as duplication of labor. Disposition error was defined positive if a patient was admitted to the ICU and was transferred to the wards within 24 hours without receiving any critical care. There was moderate preconsensus interobserver agreement in identifying duplication of labor and disposition error ($\kappa = 0.49$), similar to prior studies [8]. Finally, we investigated the management of patients in shock with appropriate access before transfer as a means of assessing care quality. Shock was defined if patient arrived with a mean arterial pressure less than 65 mm Hg with our without central access established.

2.5. Statistics

A summary of variables, their definitions, and their measures is reported in Supplemental Table III. Demographic information was presented as a number and percentage for a dichotomous variable, and a median and interquartile range (IQR) for a continuous variable. Multivariate logistic regression was used to evaluate the relationship