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Feature Article

Use of Failure Mode and Effects Analysis to Improve Emergency Department Handoff Processes

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Purpose/Objectives:
The purpose of this article is to describe a quality improvement process using failure mode and effects analysis (FMEA) to evaluate systems handoff communication processes, improve emergency department (ED) throughput and reduce crowding through development of a standardized handoff, and, ultimately, improve patient safety.

Background:
Risk of patient harm through ineffective communication during handoff transitions is a major reason for breakdown of systems. Complexities of ED processes put patient safety at risk.

Rationale:
An increased incidence of submitted patient safety event reports for handoff communication failures between the ED and inpatient units solidified a decision to implement the use of FMEA to identify handoff failures to mitigate patient harm through redesign.

Description:
The clinical nurse specialist implemented an FMEA. Handoff failure themes were created from deidentified retrospective reviews. Weekly meetings were held over a 3-month period to identify failure modes and determine cause and effect on the process. A functional block diagram process map tool was used to illustrate handoff processes. An FMEA grid was used to list failure modes and assign a risk priority number to quantify results.

Outcomes:
Multiple areas with actionable failures were identified. A majority of causes for high-priority failure modes were specific to communications.

Conclusion:
Findings demonstrate the complexity of transition and handoff processes. The FMEA served to identify and evaluate risk of handoff failures and provide a framework for process improvement.

Implications:
A focus on mentoring nurses to quality handoff processes so that it becomes habitual practice is crucial to safe patient transitions. Standardizing content and hardwiring within the system are best practice. The clinical nurse specialist is prepared to provide strong leadership to drive and implement system-wide quality projects.

KEY WORDS:
ED crowding, ED throughput, handoff and communication, handoff and patient safety

The Joint Commission's Sentinel Event program has identified poor handoff communications as contributors to death and serious physical and psychological injury.[1] The leading root cause of sentinel events reported from 1995 to 2006 was related to communication. It is estimated that 80% of serious medical errors involve miscommunication during handoffs; consequently, every patient handoff provides opportunities for error and harmful patient outcomes. In 2004, the important safety strategy of preprocedure verification and timeout used to conduct a final assessment was put into place to prevent patient harm.[2] Similar attention to the critical conversations that should occur during handoff procedures has been addressed by multiple sources.[1,3–6]

Recognizing poor communication as a major contributing factor to medical error has led to research and discussion on improving healthcare safety over the past decade. An investigation of how medical errors happen in an emergency department (ED) addressed the multiple variables that can lead to adverse events.[7] Emergency department professionals experience intense pressures when faced with situations where obtaining adequate medical history to evaluate a patient is less accessible. Pharmacy support may be reduced or unavailable on some shifts. Inconsistent arrival times of

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patients, changing patient locations as rooms are made available for incoming patients, and more individual procedures and decisions add to the opportunity for errors. Complexities of the ED processes put handoff at risk, and efforts to address a standardized process to reduce errors are recognized as necessary to improve patient safety.[8–10] Staffing to patient volume and patient arrivals in an ED is a common model used to meet the needs of fluctuating patient arrivals.[11] Emergency departments provide clinical care 24 hours a day. Staggered start and stop times for both nursing and physician providers to accommodate the variables associated with patient volume, patient acuity, and ED length of stay are standard practice.

There may be no other area in the hospital that experiences the number of handoffs as the ED. Handoff requires a concentrated effort to ensure all pertinent information is accurate and up to date. Many ED patients are unstable and may require diagnostic testing; thus, multiple handoff reports to ancillary services are common. Threats of losing critical information are commonplace in an ED where patient arrivals are unpredictable and interruptions are unavoidable. Therefore, the need for timely dissemination of clinical pertinent information is necessary to prevent omissions of critical information. This article focuses on a hospital performance improvement project using failure mode and effects analysis (FMEA) as a tool to identify handoff process failures and find solutions for redesign.

Background

Many factors in the ED influence the ability to transfer information during handoff. The widespread practice of boarding ED patients while waiting for an inpatient bed is a major contributing factor that may result in reduced quality of care and increased risks to patient safety.[12] Inability to transfer patients from an ED to inpatient areas results in staff stress, frustration, and dissatisfaction. Managing new and existing patients may contribute to hurried environments and errors through decreased compliance with clinical guidelines and inappropriate decision making.[13] Human factors principles suggest that errors occur more often through individual failures and system vulnerabilities when systems are stressed.[14] Prevalence of stress and burnout in healthcare providers affects the overall quality of care. Systems stress threatens patient safety through breakdowns in hospital staff communication.

The Institute of Medicine suggested that the healthcare industry is a complex system, and an ED may be vulnerable to breakdown from unexpected or invisible failure resulting in serious consequences.[15] Risk of patient harm through ineffective communication is well documented as a major reason for breakdown of systems, thus the recommendation to standardize the handoff process. Simplifying handoff through standardization may reduce miscommunication, errors, and fragmentation that occur.

The conceptual framework of Donabedian's[16] "structure, process, outcome" is highly regarded for studying healthcare quality. Donabedian's framework defines safety as a critical element of healthcare outcomes. Applying Donabedian's model to the project situated the project in that it examined how risks and dangers within the structure of handoff of care have the potential to cause harm. Guidance for improvement of handoff processes is improved though examining ED inputs, throughputs, and outcomes.

REVIEW OF THE LITERATURE

There are multiple factors that affect ED processes and outcomes. Intervals measures, ED factors, and components of evaluation and treatment should be considered when examining how ED crowding affects inpatient admissions and transitions of care.[17–20] Drilling down input and output factors to quantify their impact on throughput and output may require review of department arrival patterns including the day of the week, time of day, inpatient bed utilization, technology, staffing, timeliness to interventions, and laboratory and radiology turnaround times; all are additional processes that make a difference in throughput.

Active bed management has been shown to impact reduction in interval measures and improve output.[21–23] The link between prolonged ED length of stay, adverse outcomes, and increased mortality is well established.[24–26] Inability to admit patients to inpatient beds may contribute to ED crowding, placing an increased workload on ED personnel, particularly nurses who are already caring for other patients. The effects of crowding on inpatient admissions may hinder throughput and output processes, thus increasing staff frustration and reducing the ability to transfer patients to the next area of care, increasing risk of patient harm.

Multiple communication discrepancies may transpire that lead to ineffective handoff.[27] Failures may originate not only from the volume of information exchanged between sender and receiver but also from the disruptive background noise and many interruptions that occur. Diversions contribute to system strain when attempting to handoff patients and make it difficult to ensure patient safety. Differing expectations of information communicated among versus between providers, even though there was a shared goal of providing quality patient care, may contribute to communication failure. Complexities of the ED processes put handoff at risk, and efforts to address a standardized process to reduce errors are necessary to improve patient care transitions.

STRATEGIES FOR IMPROVEMENT

Safety Event Reports

Safety event reporting provides critical information and is a core support used to detect patient safety and quality events in healthcare organizations. Reporting safety concerns is significant in creating a culture of safety because

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it allows for analysis and prevention of harm through learning. Safety event reporting where this performance improvement project was completed is a confidential, blameless, nonpunitive, voluntary system used by all hospital personnel. Detailed information of an event is accomplished through an electronic submission. Reports are reviewed daily and tracked for trends or serious events. Reporting is encouraged with emphasis placed on safety events that reached the patient, safety events that did not reach the patient or near misses, and an unsafe condition that increases the probability of a patient safety event occurring. An increased number of safety events reported for handoff communication failures in ED-to-unit handoffs led to a decision to complete the FMEA by addressing potential failures and failures of the handoff process in a population of professional registered nurse personnel who are responsible for providing and receiving patient handoff transition reports. Failure mode and effects analysis systematically identifies design of the process and how failure may occur.

Failure Mode and Effects Analysis

The Institute for Healthcare Improvement (IHI) recommends the use of FMEA as a proactive method to assess risk of failure and harm in processes.[28] Failure mode and effects analysis has historically been used in high-risk industries such as military and aerospace and was adopted by healthcare to address patient safety. Failure mode and effects analysis is a prospective, systematic approach to examine, identify, and understand contributing causes of failure or potential failure and the effects on the patient and system if failure occurs. Corrective action is assigned to the process requiring change to prevent future failures and provides a foundation for continued improvement. Implementation of the FMEA process requires several individual steps. The format used was downloaded directly from IHI and is outlined in the following list:

1. *Define the process to analyze.* There are multiple ways a process analysis may be initiated. Most commonly, a decision to begin an analysis is in response to a safety event, a near miss, or sentinel event. Failure mode and effects analysis is also useful prior to implementing a new process to assess the effect on the changes to a new process and assess the impact of a process changed.[29]
2. *Assemble a multidisciplinary team.* Frontline clinically active team members familiar with a process that requires evaluation and committed to identifying opportunities to make changes to the design are appropriate choices. Failure mode and effects analysis is a prospective risk analysis that benefits from expertise but may also include those who are less acquainted with a process. Complex processes such as handoff communication regularly involve numerous individuals. Ashley et al[29] identified that 1 individual most likely will not hold sufficient knowledge of a process to conduct FMEA. Utilizing a multidisciplinary committee to evaluate a process is necessary to guard against bias. A challenge faced for committee meetings is perhaps securing availability of members at scheduled times. Leadership support is needed to assist in scheduling demanding or problematic shifts to allow attendance. Regular scheduled times are necessary to allow for advanced planning. Each meeting consists of constructing the previous meeting, and it is crucial that attendance is met.
3. *Map out the process.* Use of a flowchart allows detail and direct visualization of each step of the process. A functional block diagram process map is the tool used for this project to illustrate each step of the handoff process (Figure). Functional block diagram determines all major system components and system subprocesses by clear identification of all steps of a process being evaluated. To use the functional block diagram, each potential failure of the handoff process was listed in the upper block of the diagram. Subprocesses of the failure mode were listed in the block below each failure mode, and a cause(s) for failure was listed.
4. *Identify failure mode(s) and cause(s).* When the committee members agree that all possible processes and subprocesses are listed on the process map, steps in the process are transferred to the FMEA grid and listed in column 1 (Table 1). Failure mode or anything that could go wrong is listed in column 2. Failures occur in multiple ways and address the importance of inviting a multidisciplinary committee to complete a systems evaluation. Communication discrepancy, human errors, policies, equipment, or tools are just a few of the multiple interactions that made up components of a handoff process. For each failure mode, all possible causes are listed in column 3. Each step of the process is evaluated for failures and causes through team brainstorming.
5. *Criticality analysis and risk priority number (RPN) scoring.* Failure effects are determined and listed in column 4. Effects are determined with answering the question, "What is the outcome when failure occurs?" Importance is placed on all possible failure effects that may result in harm to the patient or organizational operations. In columns 5 through 7, numeric scoring is completed for likelihood of occurrence or frequency of the failure, likelihood of detection or how likely the failure is going to be detected, and severity or potential effects of an outcome of each failure. Each column is numerically scored between 1 and 10. A score of 1 measures it is unlikely harm will occur, and a score of 10 measures the most severe harm or death will occur. Scoring of likelihood of detection may confuse

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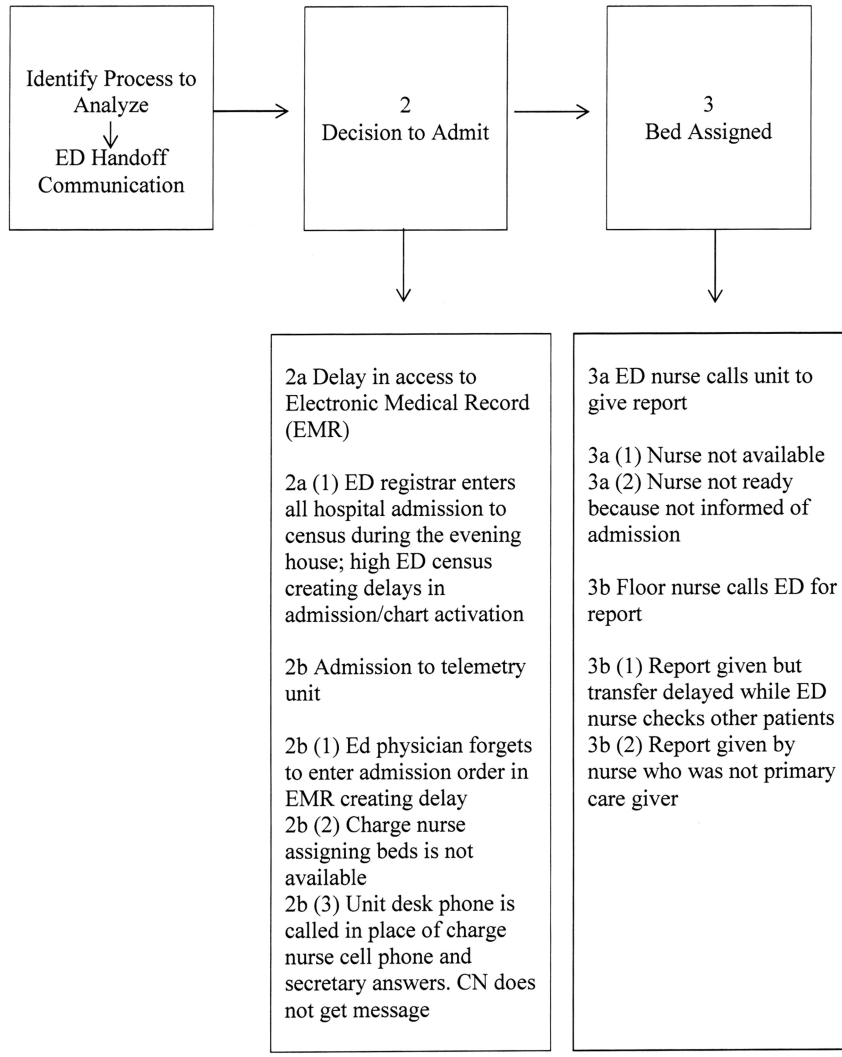

FIGURE. Example handoff communication failure mode and effects analysis: steps of functional block diagram process mapping.

the user because a score of 10 measures it is very unlikely to detect. A failure that is unlikely to detect requires a higher priority because it is one that easily goes unnoticed. For a severity score, team members were directed to determine the likelihood of the most severe outcome and most severity of harm, including death.

6. *Scoring RPN to prioritize areas of focus.* The product and final RPN is obtained through multiplying the 3 scores for likelihood of occurrence, likelihood of detection, and severity. When numeric scoring is completed and critical failures identified, the RPNs are ranked to allow for prioritization, and a redesign of the process is implemented. The Institute for Healthcare Improvement suggests improvement opportunities should be considered for the top 10 highest RPN scores. A goal that requires every process reliable may be unrealistic with limited resources. Lowest scores are not prioritized but evaluated for elimination and informal solutions that may be assigned or solved at team meetings. For this project, a redesign committee of individuals familiar with a process prioritized for change was formed to discuss best practice and implement changes.
7. *Evaluate results for redesign improvement efforts.* Establishing the root cause of a critical failure allows for remedial actions or process changes to eliminate the threat. Evaluation of the actions may perhaps be accomplished through periodic review with the team members, audit, rounding, and observation to assess improvements in safety.

ED-to-Unit Handoffs

The ED was chosen as the unit to focus the project on because of multiple complexities, interactions, and communications connected with most departments in the hospital. The improvement-related questions of the FMEA asked if developing a process to improve patient handoff

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Table 1. Example: Handoff Communication Findings Using a Failure Mode and Effects Analysis (FMEA) Grid

Steps in the Process	Failure Mode	Failure Causes	Failure Effects	Likelihood of Occurrence (1–10)	Likelihood of Detection (1–10)	Severity (1–10)	Risk Priority No.	Actions to Reduce Occurrence of Failure
Decision to admit	Delays to admission and access to electronic medical record	ED registrar enters all hospital admissions to the census during the evening hours; high ED census	Admission delay, admission/immediate postop/stat orders cannot be entered/delay in patient care/potential for harm	5	5	10	250	
ED calls telemetry charge nurse (CN) for bed assignment	CN does not answer the phone	Desk phone is often used in place of a cell phone that is more reliable and a direct line to the CN	Delays/inconsistencies in patient admission for bed assign and receiving information	3	9	1	27	
		Not all CNs carry a cell phone	Delay/multiple calls	3	7	1	21	
	Batteries in cell phone may die	There are no backup batteries	Delays/multiple calls/multiple resources	3	7	1	21	

Abbreviation: ED, emergency department.
Steps in the evaluation process: (1) evaluate each process and subprocess from the functional block process map for potential failure cause and effects (Figure) and transfer to FMEA grid; (2) assign a score of 1 to 10 for each of the 3 categories on FMEA grid: 1 = measures very unlikely to occur and 10 = measures very likely to occur; (3) evaluate the risk priority number for each failure mode by multiplying the 3 scores; consider the top 10 scores for changes to the process; (4) action plans are developed and responsibility assigned for corrections.

would improve ED crowding and outcomes related to quality of patient care and reduction of harmful events, near misses, and miscommunication. The projected outcomes included interdepartmental cooperation and the recognition that continuity of care is the responsibility of the entire organization and not limited by or to individual departments. The overarching objective was to ensure patient safety and improve quality care.

METHODS

Prior to beginning the FMEA, approval of the project was obtained from the chief nursing officer. Institutional review board approval was obtained from the hospital system and a university. This 3-month project consisted of completing an FMEA of handoff processes. Sentinel events, patient safety event reports, opinions of frontline staff of the FMEA committee, and an FMEA process design were tools used to collect data. Electronic medical record viewing was necessary to obtain data of handoff events for committee discussion.

Setting

The project took place in a 135-bed, acute care hospital staffed by 315 registered nurses who report directly to the chief nursing officer. The FMEA was used as a tool to evaluate handoff process between a 20-bed ED, inpatient units, and ancillary departments excluding the acute rehabilitation unit where patients are generally not admitted from the ED. Approximately 35 000 adult and pediatric patients are treated each year in this rural ED. Twenty-five percent of all patients who are treated in the ED are admitted as inpatient or observation status.

Selection of Participants

Completing an FMEA is a multidisciplinary team function that benefits from knowledge and experience of frontline clinicians to identify ways in which processes may fail or potentially fail. Formation of the committee was through invitation of 12 team members, of whom the majority own subject matter expertise in handoff processes consisting of registered nurses employed at varying levels, a radiology technician, a respiratory technician, and a pharmacist.

Committee Meetings

The initial committee meeting consisted of discussion of the FMEA process including goals and scope of the handoff project. Focal points were identified using safety event report reviews; themes were developed and communicated to the committee with handouts and discussion. Utilization of FMEA realized the tool supports goals to assess and identify high-risk failures in handoff communication in ED-to-unit transitions, promotes development of new processes aimed at mitigating preventable patient harm, influences

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enhanced organizational communication to improve ED throughput, and improves overall quality of patient care. Identifying and understanding what can go wrong in a process determine how these failures affect patient safety and patient outcomes and support redesign processes.

Emergency department patient input, throughput, and output were reviewed to assist members in understanding the dynamics of the ED and differences of an outpatient department from the inpatient department. Behavioral rules were also discussed at the start of the first meeting. Behavioral rules direct that all conversation would be confidential, respectful, and without blame. Emphasis was placed to stay on topic to facilitate completion of the FMEA. Clarification and description of how the committee members identify failure modes or potential failure modes and how failure modes affect patient safety were incorporated using discussion, handouts, references downloaded directly from the IHI, white board, and a computer with a projector. Using a computer allowed changes to be made directly on the form and guided discussion. Weekly committee meetings were held for 1 to 2 hours over a 3-month period. Barriers included blame or resistance to some conversations from committee team members.

Instruments and Data

Meetings consisted of discussion and brainstorming failure modes and potential failure modes and determining cause and effect on the process. The committee defined all steps of the handoff process. Mapping steps were continued from the time of decision to admit through the time of patient arrival to their assigned room on the unit. When process map diagraming was completed, findings were transferred to the FMEA grid. Action plans were completed on the FMEA grid with steps to prevent future failure mode(s) with a defined measure of correction(s), steps for monitoring, dates to implement changes, and an assigned individual for follow-up.

Data Analysis

Assigning the RPN supported team members to prioritize areas of focus. The priority of focus was decided upon depending on criticality of the number. Decision tree analysis was used to determine severity of the effect and the effectiveness of controls in place to detect the issue. Questions in the decision tree analysis asked if the failure would result in system failure and whether there was an existing control in place.

RESULTS

The FMEA revealed multiple areas with actionable failures. Using FMEA as a quality improvement strategy offered clarity to the handoff process from the ED to inpatient and ancillary areas to critically evaluate failures. Twelve subprocesses were evaluated and identified, 55 potential failure modes, and 84 potential causes (Table 2).

The RPN ranged between 15 and 250. Highest-ranking issues were validated with patient event reports and supported by consultation with the team. A majority of causes for high-priority failure modes included issues specific to communication. There were 30 subprocesses with an RPN greater than 100 prioritized for referral to an FMEA handoff redesign committee. Many RPNs with a score less than 50 were immediately resolved or referred at the time of the FMEA. All FMEA findings were referred to nursing shared governance council for review and solicitation of a handoff redesign committee.

Decision to Admit

Brainstorming discovered that 1 ED registrar was responsible for all admissions throughout the hospital during the evening and night shift hours. When the ED experienced high patient volume, admissions were delayed. Patients who require surgery and are admitted to the inpatient unit from postsurgical recovery may wait for registration to complete the admission paperwork and activate the chart in the computer before physician orders can be placed. This fragmented process created patient dissatisfaction because need for pain relief or other patient needs were

Table 2. Handoff Communication Failure Mode and Effects Analysis: Components and Number of Potential Failure Mode(s) and Cause(s)

Handoff Components	No. of Potential Failures Identified	No. of Potential Causes Identified
Decision to admit	3	3
ED calls telemetry for bed assignment	5	8
ED calls medical/surgical unit for bed assignment	2	2
ED calls ICU for bed assignment	1	2
ED nurse calls inpatient units to give report	12	17
Inpatient unit nurse calls ED for report	4	4
ED calls ICU to give report	3	4
Handoff report process	6	7
Handoff information transfer	6	10
Transportation for transfer	3	12
Hospitalist admission	5	6
Ancillary department handoff	5	9

Abbreviations: ED, emergency department; ICU, intensive care unit.

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not being addressed. The ordering pathway was not available until activated by the registrar. The director of registration was notified of the problem, and new protocols are being developed to alleviate physician ordering difficulties during high-volume times.

Handoff Report Process

At this organization, situation, background, assessment, and recommendation tool was adopted, and staff was instructed to use this tool as the standard practice for communication. The FMEA revealed that not all nurses used the situation, background, assessment, and recommendation tool for handoff. No standard processes were identified for admission handoff from the time of the decision to admit to patient arrival on the unit. There were multiple differences in how patient beds were assigned by the charge nurse and how handoff reports were delivered and received that would likely lead to miscommunication, missed information, omitted information, and missed actions. This was verified by the number of event report submissions to the patient safety and quality department that often followed a handoff.

The FMEA revealed that certain practices were taken for granted as part of the handoff process. One step in the handoff process at this organization is for the receiving nurse to view the ED electronic medical record prior to receiving report. Following this process will allow for questions to be formulated. Not only were all of the nursing staff not using the electronic medical record, but also the computer code for access and education during orientation were not being provided upon hire. Directors and an information support technician were notified immediately to begin steps to remedy the problem.

Transportation for Transfer

Many multidisciplinary issues related to handoff transitions were discovered. Patients were transferred to the units without notification, creating chaos and confusion. Lack of clarity in the role of transportation in patient handoff created situations that put patients in harm's way. Some of the problems were related to removing oxygen from the patient, leaving patients in rooms, or transferring patients to diagnostic studies without notifying a primary nurse. Long waits for transportation created delays to admission. It was realized that the ED is not a priority for transport. Radiology and the operating room are prioritized first. Length of stay and patient satisfaction are affected when patients wait for an inpatient room. After discussing the issues with the director of the transportation department, transportation issues were referred to the handoff redesign committee.

Transfer hall passes are designed to provide handoff information for ancillary departments and are sent with patients as they transition between departments. Information on the hall pass includes patient demographics, allergies, medications, risks of falls, and oxygen therapy. There were discrepancies found with information printed on the ED hall pass and inpatient unit hall pass. The inpatient unit hall pass contained all of the required elements for safe patient handoff. The ED hall pass had insufficient information and required nurses to handwrite some information. This led to inconsistencies in handoff information. Procedures for patient return to room after ancillary testing were identified as unacceptable for safe patient care. Hospital information service was notified to evaluate the hall pass for solutions.

The FMEA process revealed that for 1 remote telemetry unit the ED staff was not transferring patients on a cardiac monitor as the hospital policy mandated. The medical-surgical unit monitored patients who did not have positive cardiac indicators as evidenced through laboratory testing or required treatment interventions that require medications. After discussion and literature review, it was determined the telemetry admission policy should be updated to exclude this type of telemetry admission from the monitoring requirements during transfer. There was no literature found to support this practice. The policy was referred to the education department for review and updated at an interdisciplinary patient care council.

Hospitalist Admission

Multiple failed processes were linked to the hospitalist role in admission. One practice included admitting patients to units for convenience because a majority of their patients were assigned there and physician rounds could be more efficient. This created problems with the telemetry and step-down units because patients "take up" a bed without meeting criteria. Delays in admission can result when this happens. At the same time, deficiencies in criteria used to admit to the telemetry and step-down unit were discovered. Current policy in use had not been updated with inclusive criteria for admission to this higher-acuity unit. Having the requirement for appropriate criteria to admit to a unit may have discouraged the practice of admission for convenience. The hospitalist group did not have an alternative process for evaluation of admissions to accommodate increased ED patient volume. Not having an alternate process in place affects ED crowding and handoff by delaying admissions. Telemetry criterion was reviewed by a multidisciplinary team and conversations initiated for changes to the process.

Discussion

The FMEA project served to identify and evaluate risks of handoff failures and provide a framework for process improvement aimed at specific risks within a rural, acute care hospital. The ED FMEA improved understanding of the strengths and weakness of the current handoff communication

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process and emphasized where improvements could be made to reduce risks.

Findings of the FMEA demonstrated the complexity of transition and handoff processes. One intention of the project was to address the failures of the handoff process in a group of professional nurses responsible for sending and receiving handoff reports. The desired end result was to reduce ED crowding through interdepartmental cooperation. Supporting an organized and standardized way for nurses to receive information to prepare for ED admissions may serve to improve patient transitions to the next area of care.

Recommendations were made to form a redesign committee that will address developing a standardized process for improving handoff processes and patient safety. The steps of the process map served as a valuable detail of failure modes that had not been identified previously. The FMEA committee members enjoyed a beneficial learning experience and professional development. Many group discussions took place, and a new awareness of each team member's reality became evident. As issues were addressed, the barriers and tensions softened to an appreciation and understanding of each other's role on the team. This was evidenced by comments that were stated on the last day of the meetings when some team members stated how different they viewed the other departments as a result of the FMEA.

Failure mode and effects analysis is a team function and a reliable method to improve patient safety and quality. Through collaboration, an assessment of current practice can be made to ensure continuous learning and improvement. Using the FMEA process, the committee members proactively evaluated the risks associated with patient handoffs.

Development of a plan of action for correction of failures or potential failures and a date for completion were assigned to the responsible person. Process changes will ultimately be tested through pilot testing between the sender and receiver units using plan-do-study-act cycles.[30] The plan-do-study-act cycle is a model for improvement that tests change by planning it, trying it, observing the results, and acting on what is learned.

Lessons Learned

Not inviting a member of the hospitalist team to participate in the FMEA was an oversight. It was unfortunate because the FMEA could have served to educate the importance of handoff and start a conversation for solutions to future admission backups experienced with increased ED patient volume. When patients are admitted, the ED physician admits to the hospitalist service. There may be future opportunity to discuss ways that the ED can be alerted to potential admission delays before they happen. Having a plan in anticipation of patient volume serves to decongest the department quickly and improve input, throughput, and output.

Nursing Implications

Quality improvement projects require effective teams. The outcome of an FMEA is dependent on having the right multidisciplinary stakeholders involved. Knowledge, judgment, and clinical expertise all play a role in achieving best outcomes and should be considered when choosing a team. Major challenges experienced with the FMEA were for the participants to leave their units during a scheduled shift and attend the committee meetings. Participant attendance to the meetings required commitment to find adequate coverage for patient care assignments during time away from the department and for directors or charge nurses to assist with patient care assignments.

Nurses are positioned to decrease risk and design practice through identification of failures as they are ultimately frontline providers in healthcare delivery. Becoming involved in an FMEA project is a way to develop accountability for patient outcomes and form a collaborative relationship with peers and hospital administrators. The clinical nurse specialist is prepared to provide strong leadership to drive and implement system-wide quality improvement projects. Leading an FMEA clearly is influential to nursing processes and patient outcomes.

The findings of the handoff FMEA are supported in literature reviewed and comparable to many of the root causes of transition of care handoff communication failures listed in The Joint Commission report for improving transitions of care. Some of the communication failures included differences in the expectations of the sender and receiver, timing of physical transfer of the patient and handoff were not in sync as evidenced by patients arriving to the unit without notification, interruptions occurred often on all units, sender may provide incomplete information or have little knowledge of the patient when reports are sent or received by someone other than the primary nurse, inability of the receiver to ask questions with a final outcome of inadequate information exchange, and ED–to–critical care handoff failures when a sender did not have up-to-date information with laboratory tests or radiology reports at the time of handoff. The FMEA revealed failures of multiple expectations required for successful handoff.

Donabedian's framework was used in this performance improvement project to evaluate the structure, process, and outcome of handoff communication. Use of this framework was valuable to examine safety and quality of handoff transitions. Multiple structural elements were shown to influence the quality of the processes. High-risk findings led to implementation of redesign processes with the ultimate goal of improving patient safety, quality, and elimination of preventable harm. Donabedian's quality-of-care model

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suggests that handoff transitions influence patient safety, which in turn influences quality outcomes.

Handoff is contingent on the interpersonal communication skills of the sender and receiver as well as the knowledge and experience of each.[31] A focus on incorporating safety and quality and mentoring nurses to quality handoff processes so that it becomes a habitual practice is crucial to safe patient transitions. The Joint Commission suggests standardizing content and hardwiring within the system as best practice. Leadership that demonstrates commitment to successful handoff by holding staff accountable and monitoring compliance is necessary for successful outcomes.

Efforts to redesign the system of healthcare and improve safety and quality have been ongoing for years. To prepare future nurses with the knowledge and skills to improve patient care, Quality and Safety Education for Nurses was formed by nursing leaders across the country to develop a tool for nursing educators to identify gaps in curriculum so that safety and quality competencies for students could be incorporated.[32] Learning an awareness of organizational systems and how they are connected to processes that occur in the clinical environment is necessary to deliver quality and safe patient care. This FMEA demonstrates the complexities of what appears to be a simple process and the importance of understanding the multiple systems involved. Restructuring curriculum content and how we teach future nurses may benefit the goal to improve safety and quality in healthcare.

Conclusion

Through the use of proactive safety tools such as FMEA to improve the safety of high-risk processes, there is support of strategies preventing patient harm. The Joint Commission's Center for Transforming Healthcare is committed to creating solutions to healthcare's most critical safety and quality problems through analysis of specific breakdowns in the handoff processes. Taking their lead, this FMEA identified failures and potential failures within and around the handoff transition processes. A future focus should look for solutions to successful handoff transition with the expectation that all staff is responsible for safe patient transfer. With hospital administrative support, the FMEA allowed the committee to critically evaluate handoff processes and plan for improvements through standardization of processes.

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