MedEdPORTAL®
The Journal of Teaching and Learning Resources

Original Publication

OPEN ACCESS

Learning From Errors: Curriculum Guide for the Morbidity and Mortality Conference With a Focus on Patient Safety Concepts

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Citation: Garcia C, Goolsarran N. Learning from errors: curriculum guide for the morbidity and mortality conference with a focus on patient safety concepts. *MedEdPORTAL*. 2016;12:10462. https://doi.org/10.15766/mep_2374-8265.10462

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Abstract

Introduction: Morbidity and mortality conferences are Accreditation Council for Graduate Medical Education–required educational series that are part of all residency training programs. This conference offers trainees an opportunity to discuss patient cases where errors or complications may have occurred. Conventionally, most of the allotted time is spent on case presentation and therapeutic debates, which is a lost opportunity to teach fundamental principles of patient safety, error analysis, and strategies for system-wide improvement. The goal of this resource is to refocus the content of morbidity and mortality and transform it into a platform for teaching patient safety principles and emphasizing error reduction strategies. **Methods:** It was delivered as a 1-hour workshop session once a month during usual conference times. The workshop includes a mortality case review followed by a small-group activity in which trainees are assigned specific safety tasks, including systematic analysis of an error, conducting root cause analysis, and resident peer review. **Results:** Postsurveys demonstrated that 90% of the trainees either agreed or strongly agreed that the safety concepts they learned would likely improve the quality of care they provide to future patients. **Discussion:** We learned that morbidity and mortality could be used to effectively teach principles of patient safety and could create system-wide improvements.

Keywords

Root Cause Analysis, Medical Errors, Team-Based Learning, Patient Safety, Quality Improvement, Morbidity and Mortality, Clinical Learning Environment Review, Harm Scale

Appendices

A. Instructional Content Guide .docx
B. Survey.docx
C. Template for M&M Conferences.docx
D. Sample Case.docx

All appendices are peer reviewed as integral parts of the Original Publication.

Educational Objectives

By the end of this resource, learners will be able to:

1. Define and understand basic patient safety terms such as adverse event, near miss, and root cause analysis.
2. Identify the potential for error within the system and the importance of learning how to effectively engage the system at multiple levels.
3. Recognize and define key types of medical errors.
4. Understand the different types of cognitive errors.
5. Demonstrate effective teamwork skills involved in error analysis and root cause analysis.
6. Draw and illustrate a written diagram of an Ichikawa fishbone root cause analysis to identify the root causes of the medication error.
7. Investigate the types of medical error present and develop an action plan for the prevention of error in the future based on the root cause analysis.
8. Apply the types of medical error to the morbidity or mortality case.
9. Recognize the potential for error within the health care system.

10. Identify areas in their own practice and local system that can be changed to improve the processes and outcomes of care.
11. Develop collaborative teamwork skills using a shared learning model with peers.

Introduction

Preventable medical errors are the third leading cause of death in the US, claiming the lives of over 400,000 patients annually and costing the health care system $1 trillion each year.[1] These numbers underscore the need for patient safety training and education of health care professionals. As the learning environment becomes increasingly complex, it can be challenging to incorporate safety in the education of trainees.

Traditionally, the trend in undergraduate and graduate medical education training is to incorporate didactic and simulation approaches into formal classroom-style curricula to improve learning about medical errors. Although these efforts can be successful in promoting patient safety learning and practice, they are rarely taught around actual errors in a setting of morbidity and mortality (M&M) review. Today, depending on the specialty and institution, the format of an M&M conference varies tremendously among academic programs, and the goals of the conference often are not clearly defined.[2] There are several novel approaches to integrate patient safety, teamwork in health care, and graduate medical education into residency training programs.[2-4] However, there is no general consensus or guideline as to how educators should conduct this educational venture.

M&M conferences provide a "forum in which to identify adverse patient outcomes, openly discuss medical mistakes, disseminate information learned from experience, and reinforce a sense of professional accountability for patient safety."[2] Historically, little time is spent in actually analyzing the error and developing a root cause with an action plan. Learning and teaching patient safety require analysis of real errors encountered in clinical practice.[2] M&M conferences are a useful platform to address Accreditation Council for Graduate Medical Education (ACGME) competencies and engage trainees to learn from real errors. To address the need for formal safety education during M&M conferences, the Learning From Errors curriculum was integrated into our residency program. This curriculum serves as a complementary learning exercise to a formal patient safety curriculum where residents learn the basics of patient safety.

The purpose of this resource is to offer educators the opportunity to create an active, engaging, interactive-style learning environment, where trainees can participate in M&M case scenarios and demonstrate skills and core attitudes pertaining to safety education. The goals of this training program are as follows:

- To facilitate the development of collaborative teamwork skills among peers with purposeful interprofessional socialization.
- To design and create a learning exercise on error analysis and patient safety concepts using small-group facilitated activities that allow trainees to apply learned knowledge and skills.

As the learning environment becomes increasingly more complex with duty hour restrictions, it can be very challenging to incorporate a culture of safety in the education of trainees. Many strategies have been used to teach patient safety, but they are rarely taught around actual errors. This is a lost opportunity for teaching patient safety through experiential learning centered on the analysis of errors during actual live patient encounters. This is a unique aspect of this curriculum. Its purpose is also to incorporate a didactic approach to medical errors. Successful dissemination of this teaching strategy will lead to extended discussions among schools and hospitals about expanding on these activities by formally including them in existing patient safety curricula and M&M conferences.

Our Educational Objectives reflect the ACGME resident educational requirements (see the Table) and our desire to increase overall medical knowledge and promote patient safety education.[5] Specific Educational

Objectives are broken down into three fundamental areas of learning patient safety: medical knowledge in safety (Educational Objectives 1-4), hands-on skills in safety measures (Educational Objectives 5-8), and attitude and culture regarding patient safety (Educational Objectives 9-11).

Table. ACGME/CLER Milestones

Milestone	Description
SBP 2	Identify the potential for error within the system and the importance of learning how to effectively engage the system at multiple levels.
PBLI 2	Identify areas in resident's own practice and local system that can be changed to improve the processes and outcomes of care.
CLER PSP 2	Residents must engage in patient safety activities where systems-based challenges are presented and techniques for implementing changes are discussed.
CLER PSP 3	Residents perceive that the clinical site provides a supportive culture for discussing and reporting patient safety events.
CLER PSP 4	Residents must participate in real or simulated patient safety investigations (such as root cause analysis).

Abbreviations: ACGME, Accreditation Council for Graduate Medical Education; CLER, Clinical Learning Environment Review; PBLI, Problem-Based Learning and Improvement; PSP, Patient Safety Pathway; SBP, System-Based Practice.

The Educational Objectives are aligned with and fulfill the ACGME and Clinical Learning Environment Review milestone requirements for resident training.[5-7] The six ACGME general competencies are integrated into our M&M conference format. Please refer to the Table for detailed milestones.

We encourage readers to write their own overarching goals to reflect segments of the workshop they adopt for the needs of their discipline and department.

Methods

This curriculum was implemented in the Stony Brook University Internal Medicine Residency Program in 2015 at Stony Brook University Hospital and Northport Veteran Affairs Medical Center.

M&M conferences are held on a monthly basis. Faculty members select deidentified cases that involve medical errors on a monthly basis. Interprofessional leaders are invited to attend, including physicians, nurses, administrators, pharmacists, and patient safety officers from the institution. The chief resident presents a structured time line of the case. The conference follows an interactive, small-group format in which each resident cohort group is assigned specific safety tasks. Chief residents and faculty members facilitate small-group activities. The PGY-1 group is assigned to conduct an error analysis by defining the medical error and adverse event and to determine whether the medical error caused the adverse event. The PGY-2 group is given a blank Ichikawa fishbone diagram[6] and is tasked to conduct a root cause analysis (RCA) with both systems and individual contributors. This group is then expected to generate an action plan based on the RCA constructed. In an effort to promote culture, which is a crucial aspect of patient safety, the PGY-3 group is charged with conducting a resident peer review to determine if the standard of care was met. This group is also tasked to rank the effectiveness of the PGY-2's action plan and will become the stakeholder for any quality improvement initiative that has been identified. At the end of the session, take-home points, summary slides, and task assignments are reviewed with the large group of residents. Postsurveys are conducted to assess residents' perception of the educational activity. In addition, data are collected and analyzed for classification of errors and the number of systems improvements as a result of M&Ms.

Case Selection

Faculty members select deidentified cases that involve medical errors on a monthly basis. Cases are specifically chosen after comprehensive review for identifiable systematic errors and potential actionable improvements for preventing future errors. Cases can be identified by residents or through hospital administrative quality review. Types of cases are adverse events including, but not limited to, unexpected death, unplanned intubation, delay in care, and failure to escalate care. Ideally, cases that can involve multidisciplinary (e.g., medicine-emergency, medicine-surgery, medicine-consult service, etc.) and interdisciplinary (e.g., residents, nursing, pharmacy, information technology, social work, etc.) groups are preferable, as errors result at both cognitive and systematic levels.

Factors that contribute to adverse outcomes should be identifiable in the case. Examples of such factors include causes that are on both a systematic and a cognitive level:

- Communication (poor handoffs, electronic medical records cut and paste, etc.).
- Coordination of care (transfers, discharges, direct admit, etc.).
- Volume and workload.
- Escalation of care (failure to notify attending/senior).
- Delay in diagnosis/care.
- Diagnostic and decision-making errors.
- Failure to recognize change in clinical status.

Instructions for the Use of This Training Program
Step one is to read the Instructional Content Guide (Appendix A) to gain an understanding of why the safety program was developed and how it fulfills the requirements of the institution and residency program.

Step two is to decide on the level of trainees. You may use any cohort of residents. At our institution, the workshop was delivered to all medicine residents during our noon conference time once a month.

Step three is to gather small groups of eight to 10 trainees for a discussion and group activity (groups will vary depending on the number of residents and size of the program). A classroom setting is needed. See the required materials section in the Instructional Content Guide for necessary resources.

Step four is to refer to the Appendices for the actual content for the workshop.

The Instructional Content Guide (Appendix A) contains materials for the workshop. The guide is broken down into instructor preparation, workshop overview and purpose, step-by-step agenda for the workshop, required materials for the corresponding M&M cases, and faculty reference guide.

The Survey (Appendix B) is the evaluation material for the workshop. The PowerPoint template (Appendix C) can be used to introduce the conference. We used these general introductory slides each month prior to starting the case and breaking up into groups, as they include the disclaimer for M&M, ground rules, agenda, medical error definitions, and so on. The presentation also serves as an introduction to our new format for M&M, which is especially helpful for visitors outside of the residency program, as this is a multidisciplinary conference. These slides can be adapted monthly with each new case. The Sample Case (Appendix D) can be used with the new M&M format. It includes a medical error analysis, a completed Ichikawa fishbone analysis, an Agency for Healthcare Research and Quality harm scale assessment, and a standard of care determination.

Workshop Session Agenda

- 5 minutes: ground rules for M&M and recap of action plans from previous M&M.
- 10 minutes: case presentation using a time line format.
- 5 minutes: short question-and-answer for clarification questions on time line of events.
- 20 minutes: moderated small-group activities.
- 15 minutes: small groups report back to large group.
- 5 minutes: wrap-up and take-home points.

Personnel
Residents at all levels are included in this conference. Groups are divided by PGY level, as each level is responsible for different tasks. Medical students can also participate. For cases that involve multiple disciplines, it is important to specifically invite representatives from related fields. Interprofessional leaders, including physicians, nurses, administrators, pharmacists, and patient safety officers from the institution, are invited to attend. For example, a patient case on an internal medicine service where errors can be identified in communication with nursing and emergency medicine could include a representative from nursing and emergency medicine. Representatives should be briefed on the case and the focus of preventing harm on a systematic and individual level.

One chief resident is needed to lead the case and deliver the time line of events. Before each case, the chief resident and the associate program director review the time line and layout of the presentation. The chief residents also receive instructions on how to facilitate the small-group sessions. The chief residents complete the patient safety education curriculum prior to the start of the year.[8] One to three faculty members or chief residents are needed to facilitate the small-group activities. At our institution, M&M cases are selected by the associate program director in charge of patient safety. The chief resident presents the case and time line of events. The associate program director/faculty member and chief resident facilitate the small-group activities during the workshop. As an example, each small group can contain anywhere from three to 10 residents. There are three small groups: the PGY-1 group, the PGY-2 group, and the PGY-3 group. Smaller or larger groups can be created depending on the size of the residency program.

Results

We assessed the effectiveness of our new interactive M&M format with a focus on patient safety. A total of 86 trainees participated in the curriculum. Postintervention surveys demonstrated high resident satisfaction with the patient safety learning objectives. Of the survey responders (N = 86), 90% of the trainees either agreed or strongly agreed that the safety concepts they learned would likely improve the quality of care they provide to future patients. We also observed that cognitive errors were the most commonly identified error in all of the cases. This resulted in the development of a cognitive error/diagnostic reasoning lecture series for our residents.

This new M&M format has generated several successful system-wide process improvements at our institution over the past year through action plans generated at each M&M, including the following:

1. Nonstandard communication during transitions of care was the most common patient safety issue identified from M&M cases. This project was further developed by the resident-led Patient Safety Quality Council (PSQC)[9] and is detailed below.
2. Several cases noted errors related to communication involving direct admissions. Action plans from these M&Ms led to the development of the direct admission power plan in the electronic medical record, standardized direct admission algorithm from patients coming from outside hospitals, and a direct admission pager to notify the medical admitting resident. This project was also further developed by the PSQC and is described in detail below.
3. Errors in diagnostic reasoning among medical staff were identified in previous M&M cases. This led to the educational implementation of a cognitive error lecture series for internal medicine residents.
4. An M&M where a medication was missed due to expiration led to system-wide process improvement changes. With an interdisciplinary M&M, representatives from pharmacy, nursing, and information technology collaborated with medicine residents on a standard workflow for medications near expiration or missed medications. Pharmacy and nursing staff now are alerted to call the medicine team if a medication is not given. Information technology staff made changes to the electronic medical record such that medications near expiration listed thereon were changed to a different color as requested by residents to bring attention to medications that needed to be renewed.
5. One case of acute gastrointestinal bleeding shed light on gaps in technical knowledge among residents regarding reviewing lab values over time in the electronic medical record. Many residents did not know how to use tracking functions, including graphing, to trend hemoglobin levels and detect minor drops. This was later added to the training for incoming internal medicine residents.
6. In a previous M&M held jointly with internal medicine and emergency medical services (EMS), a patient was transferred to a medical floor team as a direct admission. The patient was notably sicker appearing, and a rapid response alert was called immediately upon arrival to the medical

floors. As a result of this M&M case, a protocol was put in place where if patients already accepted as a direct transfer appear worse or decompensate en route, they can be escalated directly to an intensive care unit.

Two patient safety issues identified during M&M were also brought to the attention of the resident-led PSQC[9] and eventually transformed into scholarly projects for residents. First, handoff issues were the most common safety issue brought to the attention of the council by cases in M&M. A systematic analysis of the handoff process, including a root cause analysis, was conducted. Preliminary data demonstrated that only 14 of 50 (28%) handoff sheets were completely without error. A prospective intervention handoff study was conducted within the internal medicine residency program.[10] Two methods of sign-out were compared: a conventional, nonstandardized handoff method and a systematic, evidence-based standardized handoff method. The intervention included an educational didactic followed by adaptation and implementation of the I-PASS mnemonic, a well-studied, evidence-based, consensus-driven, standardized approach to handoffs.[11] Handoffs were assessed through active surveillance and survey-based data collected from handoff recipients. Pre- and postintervention data were evaluated, specifically, the quality of handoffs, as well as the combined rate of data omission errors and frequency of medical error. Fewer adverse events occurred with I-PASS in comparison to conventional handoffs ($\chi^2 = 4.8$, $df = 1$, $p = .04$). Code status omission was less frequent with I-PASS in comparison to conventional handoffs ($\chi^2 = 9.4$, $df = 1$, $p = .003$), and anticipatory guidance was provided more frequently in I-PASS handoffs ($\chi^2 = 9.6$, $p = .003$). The overall quality of the I-PASS handoffs was rated higher in comparison to conventional handoffs ($\chi^2 = 15.6$, $df = 2$, $p = .001$). This study showed that standardized handoffs could reduce omitted key data, decrease the number of adverse events, and allow for identification of high-risk patients. The council disseminated its work to various departments at institutional meetings and was awarded best poster at our institution's annual Partners on Safety and Quality Day. I-PASS was subsequently implemented as our institution-wide method of standardized handoffs for all departments.

Adverse events and near misses surrounding unsafe direct admissions to the floors while bypassing the emergency room were also identified during M&Ms, which later became a project of the PSQC.[12] A flowchart method was used to analyze the step-by-step process of the direct admission to the department of medicine. A major lapse in communication was identified between the medical admitting resident (the sole communicator and distributor of all incoming medicine admissions) and the person designated to admit the patient. A total of 42 medicine-direct admissions from outside hospitals were examined, and only 16% (seven out of 42 patients) were communicated to the admitting physicians; 35 patients were directly admitted to the floor with no communication to a physician. Patients were often left for hours without evaluation or admitting orders and at times were sent to an inappropriate level of care (e.g., unstable patients ending up on general medicine floors). A protocol for direct admits was initiated:

- Formal communication is established from attending physician of transferring hospital to attending physician of receiving hospital prior to the patient being accepted for transfer.
- EMS is alerted regarding the transfer by the outside hospital, and EMS alerts the medical admitting resident.
- Once the patient is assigned a bed by the admitting office, an automatic real-time page is generated to the medical admitting resident pager, a newly implemented assigned pager to warn of incoming direct admits that might otherwise be missed or not be approached in a timely fashion.

Two months after implementation, we had 100% communication of all direct admits, and no patients were missed. Both of these interdisciplinary patient safety projects were presented and awarded at Stony Brook University's 4th Annual Partners in Safety and Quality Day and nationally at the American Association of Medical Colleges Integrating Quality Conference.[10,12]

Discussion

This interactive, collaborative M&M model with a focus on patient safety concepts is an effective method for teaching patient safety fundamentals. M&M conferences can be utilized as an opportunity to teach basic patient safety definitions, conduct RCA, and learn about error reduction strategies. Trainees are able

to actively participate and demonstrate the use of patient safety tools and strategies for improvement. Implementation of this curriculum is an important teaching tool that can be used to increase health care trainees' excitement and motivate them to learn about patient safety. This training program not only fulfills educational requirements but also instills necessary skills for developing lifelong habits to effectively reduce medical errors.

Limitations and Areas for Improvement

To measure the effectiveness of this learning exercise, we measured postsurvey data to assess overall satisfaction and effectiveness. The majority of trainees reported that the content of the workshop would impact their clinical practice. We did not assess trainees' ability to apply key principles of patient safety in real clinical scenarios. We also did not conduct a medical knowledge assessment test to assess for pre-post difference. Ideas to improve this curriculum include the development of patient safety direct observation tools (DOTs) and other assessment tools to evaluate whether trainees are applying the learned skills in their practice. Recently, DOTs have been implemented to assess compliance and effectiveness of using standardized handoffs, as described previously. Data are currently still being collected as part of this project's second PDSA (plan, do, study, act) cycle. DOTs can be completed during routine patient care on the wards or separately on an event basis, such as discovery of adverse events or near miss.

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Disclosures
None to report.

Funding/Support
None to report.

Ethical Approval
Reported as not applicable.

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Received: May 10, 2016 | **Accepted:** August 22, 2016 | **Published:** September 23, 2016