Morbidity and Mortality Revisited: Applying a New Quality Improvement Paradigm in Oncology

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Adverse events, medical errors, and system failures inevitably occur in medicine despite individual provider effort, care, and expertise. Over the last two decades, increased awareness of adverse events (AEs) led to a renewed focus on patient safety and quality improvement (QI), heightened by the Institute of Medicine's landmark 2000 report, *To Err is Human*.¹⁻⁵ Despite these efforts, front-line providers rarely take part in systematic reviews of adverse events, directly participate in improvement initiatives, or receive feedback regarding outcomes of implemented changes.

The origins of morbidity and mortality (M&M) conferences stem from the work of early quality pioneers such as Ernest Codman, MD, a surgeon who encouraged physicians to follow long-term outcomes of patients in his 1910 "End Results" thesis. Evaluating the quality of care was central to each patient's end result: "Did the patient get entirely well? If not—why not? Was it the fault of the surgeon, the disease, or the patient? What can we do to prevent similar failures in the future?"⁶ Out of this work, M&M conferences developed to provide a forum in which clinicians discuss adverse events in an attempt to improve patient safety and care.⁷ By the end of the 20th century, the majority of general surgery and internal medicine programs participated in regular M&M conferences.^{8,9}

Though common in academic training programs for over a century, M&M conferences rarely had methodical approaches to address root causes and implement systemic change, often instead degenerating into adversarial affairs.⁷ M&M conferences were traditionally led by general practitioners with limited participation by specialists, who—if present—typically provided the consultant perspective. More recently, M&M conferences have been revisited as a mechanism to (1) identify AEs or near misses; (2) review AEs in a systematic manner; (3) engage physician and nonphysician providers; and (4) identify QI strategies to address systems-based issues.^{4,10} This systems-based approach to morbidity and mortality conferences has been implemented at a number of internal medicine departments nationally.¹¹⁻¹⁵ This transition was associated with several positive outcomes, including a large number of system improvement recommendations, improved trainee perception of conferences and patient safety, and achievement of multiple Accreditation Council for Graduate Medical Education core competencies. Several divisions of medical oncology, including at our institutions, initiated similar conferences to

specifically address the unique opportunities and challenges within oncology.^{16,17}

Using this new QI paradigm—termed "Morbidity, Mortality, and Improvement" (MM&I)—we collectively conducted 11 multidisciplinary conferences throughout the 2013 to 2014 academic year at two tertiary academic cancer centers and a satellite community-based oncology practice. We present our approach including key components and an example case.

Case History

Note: Certain elements have been changed to protect patient confidentiality.

A 57-year-old male with locally advanced non-small-cell lung cancer contacted his medical oncologist for fever and a productive cough 15 days after initiating concomitant chemotherapy and radiation. He was directed to the clinic for evaluation and treatment. The patient instead went to the radiation oncology department, where he was found to be tachycardic (heart rate, 106) and hypotensive (blood pressure [BP] 90/49), but afebrile (temperature, 97.7°F). He was escorted to the oncology clinic, where upon arrival he was increasingly hypotensive (BP, 79/46). Intravenous fluids were administered with improvement in his vital signs (BP, 112/46, heart rate, 89). His absolute neutrophil count was 280 cells/uL. Given the need for hospital admission, the patient was transferred to the emergency department before administration of antibiotics. In the emergency department, blood cultures were drawn and appropriate antibiotics administered. The time from presentation to the medical center to antibiotic initiation was 3 hours and 45 minutes, notably above the recommended time to antibiotics for febrile neutropenia of less than 2 hours.¹⁸ The patient was identified as experiencing a so-called near miss due to delay in antibiotics for febrile neutropenia.

MM&I Conference

The MM&I conference format has several fundamental differences compared to the historical M&M. The MM&I conference leader purposely selects a case with systems-based issues after systematically considering cases from all formal and informal reporting mechanisms (Figure 1; box 1). Cases are gathered from the hospital reporting system and through conversations with colleagues. The latter method is particularly fruitful because it uncovers otherwise unreported cases, allows for education on incident reporting, and creates a culture that supports

Figure 1. Key steps of a Morbidity, Mortality, and Improvement Conference.

discussion of patient safety. The MM&I conference leader then selects an appropriate case with the input of institutional quality and safety administrators and the conference presenters. While MM&Is historically gravitated toward the most dramatic cases, we preferentially identify cases with evidence of system failures. Near misses—medical errors or system failures that do not ultimately result in patient harm—are not as emotionally charged and may more easily allow for respectful and honest discussions.

The prework before an MM&I conference presentation requires preparation of the case through the execution of a root-cause analysis (Figure 1; box 2). Reviewing adverse events offers an opportunity to teach QI methodology and can be incorporated into the curriculum of an academic setting. At one institution, before acting as the MM&I conference presenters, fellows learn how to do a root-cause analysis through a half-day training led by faculty experts. Involved clinicians are invited to participate in the case analysis.

If they did not participate in the prework phase, stakeholders should be involved at the time of the MM&I conference (Figure 1; box 3). It is critical to establish a multidisciplinary approach that involves physicians, advanced practice providers, medical assistants, nurses, pharmacists and administrators. Leaders of the institutions' quality and safety and risk-management programs participate in each conference in order to integrate the case and its discussion into the formal safety peer-review process and screen for cases that warrant higher-level evaluation and intervention. When pertinent to the case, we invite guests outside of medical oncology, including surgery, radiation therapy, pathology and radiology. Involving stakeholders not only provides a 360-degree view of the case, but also more rapidly facilitates change. We recommend that an uninvolved third party present the case and lead the discussion. The peer-reviewed and confidential nature of the conference and the importance of providing a supportive forum are stressed at the opening of each MM&I conference.

The majority of the 60-minute noontime MM&I conference is directed towards case discussion, cause identification, and the development of potential solutions, each component taking approximately 20 minutes of the conference (Figure 1; box 4). After the case facts are presented, discussion is encouraged with the moderator steering comments toward the different contributing factors including those resulting from clinician, patient, team, and systems-based issues. We aim to focus on systems-based issues while not discounting the individual accountability of the just culture framework.¹⁹ We capture the discussion on a modified fishbone diagram²⁰ (example in Figure 2) or per Vincent's contributing factor table.²¹ Documenting the discussion ensures that attendees can visually

see that their input is recognized and provides a framework from which to develop an action plan using an Impact Effort Matrix.²²

An MM&I-generated action plan requires dedicated follow-up to materialize into an improvement project and to study the impact of any interventions (Figure 1; box 5). Within the month, the MM&I action plan is circulated to those responsible for its review and implementation. At one institution, the action plan is passed off to the established Patient Safety Committee, while in another, an MM&I Working Group is convened to develop the QI project and to implement change. We aim to follow the Institute for Healthcare Improvement's (IHIs) plan-do-study-act (PDSA) cycle approach.²³ This is another opportunity for trainees to gain first-hand experience with QI methodology. Institutional support from quality and patient safety leaders and program directors are central to ongoing success.

Reporting back to MM&I conference attendees the status of these QI projects maintains investment in the process and gives participants satisfaction that the MM&I conference discussions are effecting change. We start each MM&I conference with a brief update of project progress from past conferences.

Case Revisited: Example MM&I

The case previously described was identified through informal discussions with fellows. The involved provider and uninvolved presenter performed a root-cause analysis. Conference participants included faculty and trainees, the patient's providers, and representatives from radiation oncology, pharmacy, nursing, and patient safety and quality. Four main issues were identified during the discussion: (1) insufficient medical knowledge regarding the timing and risk of neutropenia; (2) a culture that encourages trainee autonomy but may not provide adequate supervision in the acute setting; (3) insufficient processes to identify febrile neutropenic patients in the clinic; and (4) policies that may not incorporate recent evidence-based guidelines for febrile neutropenia. A modified fishbone diagram was populated during the conference (Figure 2).

Two weeks after the MM&I conference, a group of stakeholders convened to focus on delay in antibiotics. Action items included updating and educating staff on the existing fever and neutropenia protocol and then completing a PDSA cycle measuring pre- and postintervention time to antibiotics for febrile neutropenic patients. The result of this discussion was an institutional level study of time to antibiotic delivery in the clinic and an institution-wide PDSA cycle to improve time to antibiotics in febrile neutropenic patients.

Figure 2. Example modified fishbone diagram. During Morbidity, Mortality, & Improvement conferences, discussion is captured through a modified fishbone diagram. Broad categories are identified through case discussion (bold) and specific points (horizontal arrows) used to fill in the diagram. Issues are grouped into categories either during or after the conference. ER, emergency room; F&N; fever and neutropenia.

Discussion and Future Opportunities

We found that the MM&I conference can be successfully implemented within the subspecialty of adult oncology. The MM&I conference offers several important successes: capture of AEs or near misses that otherwise may go unreported (15 out of 17 presented cases thus far at the academic institutions have been from informal reporting mechanisms); collaboration of a multidisciplinary group in a structured review of these cases; involvement of fellows and attendees in discussions of systems-based quality improvement; and establishment of a cycle of ongoing QI projects.

At the first two MM&I conferences of the 2014 to 2015 academic year at each of the academic institutions, participants were provided an optional survey regarding their conference experience. The survey, designed to gather information and facilitate ongoing improvement of the conference, was initially piloted among several fellows, attendings, and other participant types at both sites. The response rate was 43% with a total survey number of 58. 43% were hematology/oncology fellows, 22% were attending physicians, 12% were administrators, 10% were nurses, and 7% were physician assistants and nurse practitioners. Survey response rates by group were proportional to

attendance. 80% of participants felt satisfied with the conference while 60% noted that they would be more likely to file an event report after participation. Notably, attendees felt that the conference provided a safe environment—91% felt comfortable expressing their opinions. As the MM&I conference at both institutions developed from a fellow-based conference, fellows were relatively over-represented as attendees and survey respondents. In the future, we strive to improve attendance to greater reflect the distribution of care team members, specifically increasing nursing involvement.

Of the two major goals of the MM&I conference—educating fellows and attendees on systems of care and root-cause analyses; and developing interventions to improve patient care—we demonstrate that it was easier to fulfill the educational than the interventional aims. Ninety-seven percent of participants noted that contributing factors were clearly identified, 91% that potential interventions were clearly discussed, and 95% that the presenter discussed a tool used in improvement science. In each of 10 MM&I cases at the two academic medical centers in the 2013 to 2014 academic year, several of Vincent's Contributing Factors were identified by participants: Patient (eight cases), Task (seven cases), Individual staff member (nine

cases), Team (nine cases), Work environment (10 cases), Organization and management (seven cases) and Institutional (four cases).

The MM&I approach identifies concrete issues and generates action plans but not every MM&I conference results in practice change. Of the 10 MM&I cases described above, recommendations were generated in the domains of data collection (five cases), education (nine cases), protocol change (five cases), and process change (seven cases). Of the recommendations, 40%, 100%, 100%, and 57%, respectively, have been implemented to date. Of these domains, it is evident that data collection and process changes have taken longer to implement than education and protocol change recommendations.

While one institution found that handing-off cases to an established Patient Safety Committee provided a forum where the feedback could be operationalized into action, another institution's MM&I Working Group reports on a scheduled basis to the institution's Quality Leadership Council. Of the 10 MM&I cases in 2013 to 2014, eight were formally reviewed at the external committee and working group meetings. All cases are documented through a report in the institution's formal patient safety reporting system.

Moving from the MM&I conference to implementing action plans requires involvement of administrative leaders who can champion such efforts. Future plans include analyzing the effect of the MM&I conference on staff reporting of adverse events and its generation of practice changes, including both process and outcome measurements.

Fellowship programs can use trainee participation in the MM&I conference to fulfill Accreditation Council for Graduate Medical Education's core competency in systems-based practice. Participating physicians can also earn American Board of Internal Medicine Maintenance of Certification credit.²⁴ Experiential learning is a key ingredient in quality improvement education and the MM&I is an ideal platform.²⁵ On an institutional level, the conference supports a culture of patient safety and demonstrates that reporting AEs does not result in individual blame, rather a thoughtful investigation by peers to improve

care. On a national level, morbidity and mortality conferences appear to be increasing focus on systems of care and engaging trainees. Involving training program directors to explore this dynamic could provide insight into how to implement and sustain the quality improvement focus in M&M conferences.

In summary, the MM&I conference provides a modern approach to reviewing cases of adverse events with a systems-based focus. It is accessible to broad populations—trainees and faculty, physicians and other providers, academic and community practices. With the increasing emphasis on value-based health-care delivery, the MM&I conference can act as a tool for oncology providers to improve systems and deliver high-quality care.

Acknowledgment

Supported by The Risk Management Foundation of the Harvard Medical Institutions through the Harvard Medical School Fellowship in Patient Safety and Quality (J.A.Z.). Presented in part at the ASCO Annual Meeting, "Improving Quality of Cancer Care and Patient Safety for High-Value Oncology Practice Seminar," Chicago, IL, May 29, 2014.

Both authors contributed equally to this work.

We thank Stephen Cannistra, MD, David Frank, MD, PhD, Joseph Jacobson, MD, and Anjala Tess, MD, for their support and guidance.

Author's Disclosures of Potential Conflicts of Interest

Disclosures provided by the authors are available with this article at jop.ascopubs.org.

Author Contributions

Conception and design: All authors

Collection and assembly of data: All authors

Data analysis and interpretation: All authors

Manuscript writing: All authors

Final approval of manuscript: All authors

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DOI: [10.1200/JOP.2014.003566](https://doi.org/10.1200/JOP.2014.003566); published online ahead of print at jop.ascopubs.org on April 21, 2015.

References

- Brennan TA, Leape LL, Laird NM, et al: Incidence of adverse events and negligence in hospitalized patients: Results of the Harvard Medical Practice Study I. *New Engl J Med* 324:370-376, 1991
- Brennan TA, Hebert LE, Laird NM, et al: Hospital characteristics associated with adverse events and substandard care. *JAMA* 265:3265-3269, 1991
- Vincent C, Neale G, Woloshynowych M: Adverse events in British hospitals: Preliminary retrospective record review. *BMJ* 322:517-519, 2001
- Zwaan L, de Bruijne M, Wagner C, et al: Patient record review of the incidence, consequences, and causes of diagnostic adverse events. *Arch Intern Med* 170:1015-1021, 2010
- Kohn L: To err is human: An interview with the Institute of Medicine's Linda Kohn. *Jt Comm J Qual Improv* 26:227-234, 2000
- Codman EA: A study in hospital efficiency: As demonstrated by the case report of the first five years of a private hospital. Oakbrook Terrace, IL, Joint Commission on Accreditation of Healthcare Organizations; 1996, p viii
- Orlander JD, Barber TW, Fincke BG: The morbidity and mortality conference: The delicate nature of learning from error. *Acad Med* 77:1001-1006, 2002
- Orlander JD, Fincke BG: Morbidity and mortality conference: A survey of academic internal medicine departments. *J Gen Intern Med* 18:656-658, 2003
- Pierluissi E, Fischer MA, Campbell AR, et al: Discussion of medical errors in morbidity and mortality conferences. *JAMA* 290:2838-2842, 2003
- Deis JN, Smith KM, Warren MD, et al: Transforming the morbidity and mortality conference into an instrument for systemwide improvement, in Henriksen K, Battles JB, Keyes MA, et al (eds): *Advances in Patient Safety: New Directions and Alternative Approaches* (Vol 2: Culture and Redesign). Rockville, MD, Advances in Patient Safety, 2008
- Kravet SJ, Howell E, Wright SM: Morbidity and mortality conference, grand rounds, and the ACGME's core competencies. *J Gen Intern Med* 21:1192-1194, 2006
- Bechtold ML, Scott S, Nelson K, et al: Educational quality improvement report: Outcomes from a revised morbidity and mortality format that emphasized patient safety. *Qual Saf Health Care* 16:422-427, 2007
- Fussell JJ, Farrar HC, Blaszk RT, et al: Incorporating the ACGME educational competencies into morbidity and mortality review conferences. *Teach Learn Med* 21:233-239, 2009
- Szostek JH, Wieland ML, Loertscher LL, et al: A systems approach to morbidity and mortality conference. *Am J Med* 123:663-668, 2010
- Gonzalo JD, Yang JJ, Huang GC: Systems-based content in medical morbidity and mortality conferences: A decade of change. *J Grad Med Ed* 4:438-444, 2012

16. Goodman L, Keng M, Guthrie A, et al: The Morbidity and Mortality Conference (MMC) in Oncology: A patient safety and root cause analysis (RCA)-driven approach at the Cleveland Clinic Taussig Cancer Institute (TCI). *J Clin Oncol* 32, 2014 (suppl 30; abstr 191)
17. Nallari AS, Venepalli NK, Feldman LE, et al: Early identification of high-risk neutropenia in the ambulatory setting. *J Clin Oncol* 32, 2014 (suppl 30; abstr 87).
18. Freifeld AG, Bow EJ, Sepkowitz KA, Boeckh MJ, Ito JI, Mullen CA, et al: Clinical practice guideline for the use of antimicrobial agents in neutropenic patients with cancer: 2010 Update by the Infectious Diseases Society of America. *Clin Infect Dis* 52:427-431, 2011
19. Wachter RM, Pronovost PJ: Balancing "no blame" with accountability in patient safety. *New Engl J Med* 361:1401-1406, 2009
20. Tague NR: The Quality Toolbox (ed 2). Milwaukee, WI, American Society for Quality, Quality Press, 2005. www.orion2020.org/archivo/calidad/1a/calidad_toolbox.pdf
21. Vincent C: Understanding and responding to adverse events. *New Engl J Med* 348:1051-1056, 2003
22. Andersen B, Fagerhaug T, Beltz M: Impact Effort Matrix. Milwaukee, WI, American Society for Quality, 2010. <http://asq.org/healthcare-use/why-quality/impact-effort.html>
23. Langley GL, Nolan KM, Nolan TW, et al: The Improvement Guide: A Practical Approach to Enhancing Organizational Performance (ed 2). San Francisco, CA, Jossey-Bass Publishers, 2009
24. American Board of Internal Medicine: Maintenance of Certification Guide, 2014 update. www.abim.org/maintenance-of-certification/default.aspx
25. Batalden P, Davidoff F: Teaching quality improvement: The devil is in the details. *JAMA* 298:1059-1061, 2007

AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST**Morbidity and Mortality Revisited: Applying a New Quality Improvement Paradigm in Oncology**

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