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Healthcare improvement based on learning from adverse outcomes

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Chapter 2

Toward best practices for surgical morbidity and mortality conferences: a mixed method study

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ABSTRACT

Objective

To assess formats for surgical morbidity and mortality conferences (M&M) for strengths and challenges.

Design

A mixed methods approach with local observations to assess key domains of M&M practice (i.e., goals, structure, and process/content) and surveys to assess participants' expectations and experiences.

Setting

Surgical departments of two teaching hospitals (Boston, USA, and Leiden, Netherlands).

Participants

Participants of surgical M&M, including attending surgeons, residents, physician assistants, and medical students (total n = 135).

Results

Surgical M&M practices at both hospitals had education as its overarching goal, but varied in structure and process/content. Expectations were similar at both sites with $\geq 80\%$ of participants (n = 90; 67% response) expecting M&M to be focused on education as well as quality improvement (QI), blame-free, mandatory for both residents and attendings, and to lead to changes in clinical practice. However, compared to expectations, significantly fewer participants at both sites experienced: a QI focus (both $P < .001$); mandatory faculty attendance ($P = .004$; $P < .001$) and changes to practice (both $P < .001$). In comparison, at the site where an active moderator and QI committee are present, respondents seemed more positive about experiencing a QI focus (73% vs. 30%) and changes to practice (44% vs. 16%).

Conclusion

Despite variation in M&M practice, the same (unmet) expectations existed at both hospitals, indicating that certain challenges may be more universal. M&M was reported to be well-focused on education, and certain aspects (e.g., active moderator, QI committee) seemed beneficial, but expectations were not met for the conference's focus and function for QI. Greater exchange of 'best practices' for M&M may enhance the conference's value for improving surgical care.

Key words: morbidity and mortality conference; continuing education; quality improvement; patient safety.

INTRODUCTION

Morbidity and Mortality conferences (M&M) are an established and honored practice in surgery, aiming to improve surgical care through case-based learning.¹⁻³ M&M practice is specifically related to the ACGME core competencies 'practice-based learning' and 'systems-based practice', but ultimately has the potential to address all six core competencies.⁴⁻⁶ While both education and quality improvement (QI) are shared goals for most surgical M&M conferences, considerable heterogeneity in M&M practice is apparent in the literature.^{1-3,6-13}

M&M practice has been categorized in three domains, including 'goals', 'structure' (e.g., frequency and participants) and 'process/content' (e.g., case selection, presentation and discussion)⁵⁻⁷, which have been discussed in various studies. However, fewer than half of all surgical M&M studies included in a recent systematic review of the M&M literature,⁷ discussed all domains. Together with the absence of consensus on a best practice for M&M, the limited exchange of practices poses challenges for institutions seeking a format that best fits the local context and is still effective to drive learning and improvement. Variation in M&M practice may to some extent be appropriate to account for contextual differences and to meet local needs. In any case, this variation offers an opportunity to share and learn from each other's (best) practices.

This study sought to evaluate all domains for surgical M&M practice in relation to participants' perspectives at two hospitals with different formats for surgical M&M. A mixed methods approach was used, including local observations and surveys of participants' expectations and experiences of M&M. We hypothesized that comparison of the different formats would reveal different strengths and challenges, but that participants' expectations would be more similar. The aim of this study thus was to compare practices and the extent to which expectations matched experiences in order to learn from each other's strengths and challenges.

METHODS

Design and setting

This mixed methods study assessed M&M practices of the surgical departments of tertiary teaching hospitals Brigham and Women's Hospital (Boston, USA) (BWH; Hospital 1) and Leiden University Medical Center (Leiden, the Netherlands) (LUMC; Hospital 2). Both departments have a long tradition of surgical M&M and seek to continuously improve their practice, but have different formats, which allows for comparison and exchange of practices. Just as surgical M&M practice is thought to have emerged in the early 20th century in the USA,² so too is it considered common practice in the Netherlands for over a century. In prior publications, both departments have described specific aspects of their practices, such as special M&M conferences at the beginning of the curriculum at BWH¹⁴ and routine doctor-

driven adverse outcome reporting used for M&M at LUMC since 1997.¹⁵ Both the ACGME and the Dutch Central College of Medical Specialists mandate residency programs to organize M&M conferences.^{16,17} While the institutions are of similar size (BWH: 793 beds; LUMC: 882 beds), the BWH Department of Surgery includes more and larger-sized surgical divisions that participate in the surgical M&M (Appendix 1).

For the qualitative part of this study, M&M conferences were observed by a single observer (MSdV) at both sites, which resulted in written descriptions that were presented to local M&M leaders for verification. Observations were guided by key elements of M&M practice identified through review of the literature and preceding interviews with involved clinicians at both centers. To quantitatively assess expectations and experiences of M&M, identical anonymous surveys (Table 1) were distributed at both sites. At Hospital 1, printed surveys were distributed, after verbal instructions, among all participants (n=80) at a regular surgical M&M conference without prior announcements. Surgical attendings, residents and physician assistants of Hospital 2 (n=55) were invited per email to fill out the survey online (Survey-Monkey; in Dutch) and reminders were sent after 1 and 2 weeks. Survey design was based on the observations and key elements found in the literature and included six statements covering the three domains of M&M practice: goals (focus of M&M⁷), structure (mandatory presence^{6,12}) and process/content (blame free environment^{2,8} and changes to individual practices^{8,18}). Expectations and experiences were measured on 5-point Likert scales (0-4), ranging from 'strongly disagree' to 'strongly agree' and 'never ($\pm 0\%$)' to 'every time ($\pm 100\%$)' (Table 1). A 5-point scale was used to provide respondents with a neutral response category (2),

Table 1. Survey assessing expectations and experiences of M&M practice.

	Expectations (how much it <i>should be</i>)	Experience (how much it <i>is currently</i>) ¹
1. The primary focus of M&M is education.	strongly disagree - disagree - neutral - agree - strongly agree	never - rarely - sometimes - often - every time
2. The primary focus of M&M is quality improvement.	strongly disagree - disagree - neutral - agree - strongly agree	never - rarely - sometimes - often - every time
3. M&M is free of 'shame and blame'.	strongly disagree - disagree - neutral - agree - strongly agree	never - rarely - sometimes - often - every time
4. M&M attendance is mandatory for attendings.	strongly disagree - disagree - neutral - agree - strongly agree	never - rarely - sometimes - often - every time
5. M&M attendance is mandatory for residents.	strongly disagree - disagree - neutral - agree - strongly agree	never - rarely - sometimes - often - every time
6. M&M leads to changes to my clinical practice.	strongly disagree - disagree - neutral - agree - strongly agree	never - rarely - sometimes - often - every time
A. What is a key factor for success of your M&M conference?		
B. Suggest one idea that, if implemented, would be most likely to improve the quality of your M&M conference.		
My current position is: attending surgeon - surgical fellow/trainee - physician assistant - medical student - nurse - other.		

¹ The following explanation was provided below this caption: 'never $\pm 0\%$, rarely $\pm 25\%$, sometimes $\pm 50\%$, often $\pm 75\%$, every time $\pm 100\%$

but also with more gradations of (dis)agreement (0 and 1; 3 and 4), to prevent tendencies to over-select the center of the scale to avoid voicing extreme opinions (central tendency bias), or tendencies to disproportionately select extreme categories (extreme response styles)¹⁹. Two open-ended questions asked participants to identify a key factor of success of their conference and to suggest an idea most likely to improve its quality. Ethical approval was obtained from the Institutional Review Board (#2016P001807) in the American hospital, and was not required for this type of study under Dutch law.

Analyses

Characteristics of local M&M practices were compared across the three domains (i.e., goals, structure, process/content).⁵⁻⁷ Positive and negative response categories for expectations and experiences were clustered (i.e., 0 and 1; 3 and 4) without changing the valence (i.e., negative, neutral or positive) to allow for statistical comparison. This resulted in 3-point scales for expectations (1: (strongly) disagree; 2: neutral; 3: (strongly) agree) and experiences (1: (less than) rarely; 2: sometimes; 3: (more than) often), which were also used to visualize the survey data. Proportions of participants reporting to expect (i.e., (strongly) agree) and experience (i.e., (more than) often) were compared per statement using McNemar's test for paired data (i.e., % expected vs. % experienced). Missing values were excluded. A statistically significant difference between expectations and experiences reported for a statement *within* a hospital, was defined as an unmet expectation. Responses of attendings were compared with those of others using the Chi-square test or Fisher's Exact test if expected count was less than five. Statistical analyses were conducted using SPSS software (version 23, IBM, SPSS Inc., Chicago, IL, USA).

RESULTS

Characteristics of M&M practices are compared across three domains in Table 2, and main similarities and differences will be discussed below. Additional details are presented in Appendix 1.

Similarities of M&M practices

Education is the overarching goal of surgical M&M at both institutions. Additional goals include identifying QI opportunities, and longitudinal education on patient safety (Table 2). M&M conferences are organized (bi)weekly with a duration of one hour. Surgical residents are required to attend M&M, and faculty attendance is encouraged. To enhance attendance, both hospitals have blocked time for M&M in clinic and (elective) operating schedules, and sign-in sheets are used to further promote this. Surgeons that have been involved in cases are expected to be actively involved in the preparation and to be present during the presentation

of the case. Residents prepare and perform M&M case presentations, guided by attending supervisors, fixed presentation formats and projected slides. Formal systems to track progress and effect of derived actions for QI are lacking, which is recognized as an important future goal at both hospitals.

Differences of M&M practices

Case collection occurs through manual reporting at Hospital 1. At Hospital 2, routine adverse event reporting, integrated into electronic health records, compiles an electronic list of all potential cases. Cases are selected by the moderator at Hospital 1, who then invites the involved residents to present the cases at M&M. Residents at Hospital 2 are scheduled to present at M&M and may select a case to present regardless of their involvement (Table 2). Participants are offered continuing medical education (CME) credits at Hospital 1 only. The single moderator at Hospital 1 has an active role, contributing to time efficiency (3 cases per one-hour conference) and interactivity of the discussion among participants seated in rows (i.e., theater style). There is less active intervention by moderators of Hospital 2, where moderators alternate each conference, and a less tight time schedule (1 case per one-hour conference) leaves more time for discussion with a smaller audience, all seated around a table. Hospital 1 has a dedicated Surgical Quality Improvement Committee, of which many members are present at M&M, with the capacity to identify proposed ideas and assign them to people for implementation. There is no such committee at Hospital 2, where action items are spontaneously and informally assigned to participants.

Survey

The survey was completed by 90 respondents (Hospital 1: n=53, response: 66%; Hospital 2: n=37, response: 67%), most of which were attendings, followed by residents (Table 3).

Similarities of expectations and experiences of M&M

Similar expectations were expressed by respondents of both hospitals. On average, 9 out of 10 participants (strongly) agreed that the surveyed items *should be* part of M&M (Hospital 1: 90% [79-98%]; Hospital 2: 89% [78-100%]) (Figure 1-2). Both a focus on education and a focus on QI were expected (Hospital 1: 98% vs. 93%; Hospital 2: 93% vs. 78%). Most respondents expected that M&M would change their clinical practice (80%/88%) (Figure 1-2). At both sites, just as many respondents expected mandatory attendance for attendings as did for residents (Hospital 1: both 94%; Hospital 2: both 87%).

Reported experiences also showed many similarities. The same items were least often experienced, including mandatory attendance for attendings (Hospital 1: 43%; Hospital 2: 24%) and changes to practice (Hospital 1: 44%; Hospital 2: 16%) (Figure 1-2). At both sites, 3 out of 10 respondents reported to experience an M&M free of 'shame and blame' sometimes or rarely (none reported 'never'), which included attendings as well as residents (Figure 1-2).

Table 2. Comparison of surgical M&M practices of two hospitals across three domains for M&M practice.

	Hospital 1	Hospital 2
Goals	Education (both individual/departmental) to improve quality of care	
Structure		
Frequency	Once every week (7 a.m.)	Once every 2 weeks (4 p.m.)
Location	Same auditorium	Alternating meeting rooms
Cases/duration	3 cases/60 min	1 case/45-60 min
Clinical activities	No elective surgeries or outpatient clinic appointments planned	
Participants	Faculty, residents, PAs, nurses, students Seated in rows (theater style), some standing	Faculty, residents, PAs, students Round-table setting, all sitting
Attendance	Required for residents, encouraged for attendings Sign-in sheets (CME credits)	Required for residents, encouraged for attendings Sign-in sheets (no credits)
Presenter	Senior resident or fellow involved in case	Resident scheduled to present at M&M
	Attending surgeon as supervisor	
Moderator	Staff surgeon (same individual); active role	Staff surgeon (alternating); less active role
Process/content		
Case reporting	Weekly report by most senior resident/fellow on each service (email to Education Office)	Routine adverse event reporting in EHR
Case selection	Moderator selects from cases reported	Scheduled residents select with supervisor, using case list in EHR/own experience
	3 x 15-min presentations with projected slides	1x 25 min presentation with projected slides
Presentations	Fixed presentation format, incl. literature review, local data and classifications systems for structured analyses (e.g., Clavien-Dindo classification).	
Discussions	3 x 5-min discussions with interactive text-polling	1 x 20-40 min discussion
Assistance	Audio visual services staff present Breakfast and beverages provided	Snacks and beverages provided
Actions plans	Quality Committee (present at M&M, also to present results)	Spontaneously/informally assigned to participant(s)
Repositories	Digital repository for presentations (slides)	
Follow-up/ Feedback	No formal system to follow-up on plans or feedback on effect	

PA, Physician Assistant. CME, Continuing Medical Education

Unmet expectations were identified within hospitals, with the following items being significantly more often expected than experienced: a focus on QI (Hospital 1: 98% vs. 73%; $P<.001$) (Hospital 2: 92% vs. 30%; $P<.001$), mandatory attendance for attendings (Hospital 1: 94% vs. 43%; $P=.004$) (Hospital 2: 87% vs. 24%; $P<.001$) and resulting changes to clinical practice (Hospital 1: 80% vs. 44%; $P<.001$) (Hospital 2: 88% vs. 16%; $P<.001$). Reported success factors could be grouped into 8 and 10 categories at both hospitals respectively, of which 6 overlapped, including: review of literature/data; discussion quality; educational value/focus; attendance (mandatory); organization/format and constructive environment (Table 3).

Table 3. Respondent characteristics and reported success factors and ideas for improvement.¹

		Hosp. 1 n (%)	Hosp. 2 n (%)
Respondents' current position	Attendings	20 (38)	20 (54)
	Residents	12 (23)	14 (38)
	Physician Assistant	3 (6)	3 (8)
	Medical Student	12 (23)	-
	Missing	6 (11)	-
	total	53	37
	response rate (%) ²	(66%)	(67%)
Key factors for success³	Review of literature/data	9 (24)	1 (3)
	Discussion quality	5 (14)	11 (28)
	Presentation quality	5 (14)	-
	Educational value/focus	4 (11)	3 (8)
	Attendance (mandatory)	4 (11)	3 (8)
	Moderator quality	3 (8)	-
	Organization/format	3 (8)	3 (8)
	Constructive environment	2 (5)	1 (3)
	Regularity	-	5 (13)
	Limited number of cases	-	3 (8)
	Fixed presentation format	-	1 (3)
	Focus on improvement	-	3 (8)
	total	37	40
Suggestions for improvement⁴	Increased faculty attendance	4 (17)	-
	Bigger room	4 (17)	-
	Improve case selection	2 (8)	4 (12)
	Improve communications	2 (8)	-
	System-level improvements	2 (8)	-
	Stop interactive polling	2 (8)	-
	Track/feedback improvements	1 (4)	6 (18)
	Subspecialty M&M instead	-	5 (15)
	Stronger focus on improvement	-	5 (15)
	More decision-making details	-	2 (6)
	Strive for completeness	-	2 (6)
	total	24	34

Hosp., Hospital (i.e., surgical departments of 1: Brigham and Women's Hospital, Boston, USA, and 2: Leiden University Medical Center, Leiden, the Netherlands).

¹ Column percentages. Some respondents reported two success factors or ideas for improvement.

² Hospital 1: 53 of 80 (66%); Hospital 2: 37 of 55 (67%).

³ Reported by 29 (55%) and 31 (84%) of respondents at Hospital 1 and 2 respectively. Other (n=1) reported factors include at Hospital 1: 'opportunity for discussion between different specialties present'; fixed presentation format'; at Hospital 2: 'timing'; 'relevance'; 'insight in complex cases'; 'residents' input'; 'faculty supervisor'; 'discuss many cases'; and at both: 'different specialties present'.

⁴ Reported by 22 (42%) and 29 (78%) of respondents at Hospital 1 and 2 respectively. Other (n=1) suggestions include at Hospital 1: 'rotate moderator'; 'have a senior attending comment in addition to residents comments on causality of their complication'; 'point/counterpoint topics'; 'implementable QA plan discussion'; 'call in remotely'; 'multi-institutional participation'; 'change to later time'; and at Hospital 2: 'better support'; 'attendance'; 'more frequent'; 'documentation'; 'more questions to audience'; 'presenters based on involvement'; 'more literature'; 'merge with other mortality case presentations'; 'more general themes'.

Differences between expectations and experiences of M&M

Gaps between expectations and experiences seemed larger and more common at Hospital 2, where unmet expectations were identified for two additional items, including absence of shame and blame and mandatory attendance for residents (Figure 1-2). While responses of attendings did not differ from other respondents at Hospital 1, attendings at Hospital 2 less often expected a focus on education (65% vs. 94%; $P=.048$) and less often experienced a focus on QI (10% vs. 53%; $P=.004$) compared to residents or physician assistants.

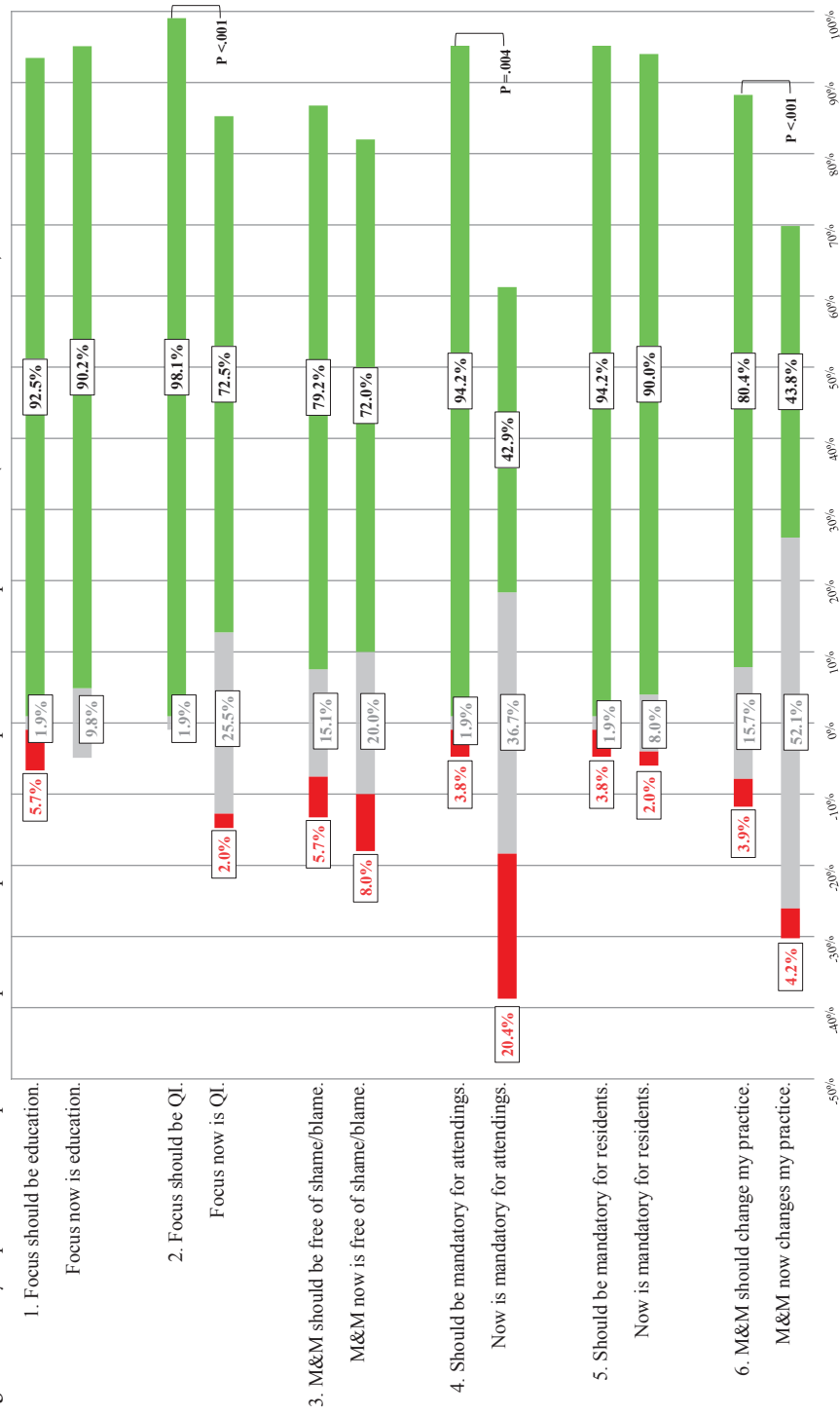
Most frequently reported success factors were 'review of literature/data' at Hospital 1 (24%) and 'discussion quality' at Hospital 2 (28%) (Table 3). Most frequently reported suggestions for improvement were increased faculty attendance (17%) and a bigger room (17%) at Hospital 1, while suggestions at Hospital 2 mostly concerned tracking of and feedback on improvements (18%), subspecialty instead of departmental M&M (15%) and a stronger focus on QI (15%).

DISCUSSION

This study used a mixed methods approach to evaluate surgical M&M practices of two hospitals with a long tradition of M&M. The M&M practices shared similar goals, but differed in various aspects on the domains of structure and process/content. Despite these differences, the same expectations for M&M were reported at both sites: most participants expected M&M to be focused on both education and QI, to be blame-free, mandatory for both residents and attendings, and to lead to changes to one's clinical practice. However, at both hospitals, significantly fewer participants experienced: a focus on QI; mandatory faculty attendance; and changes to clinical practice.

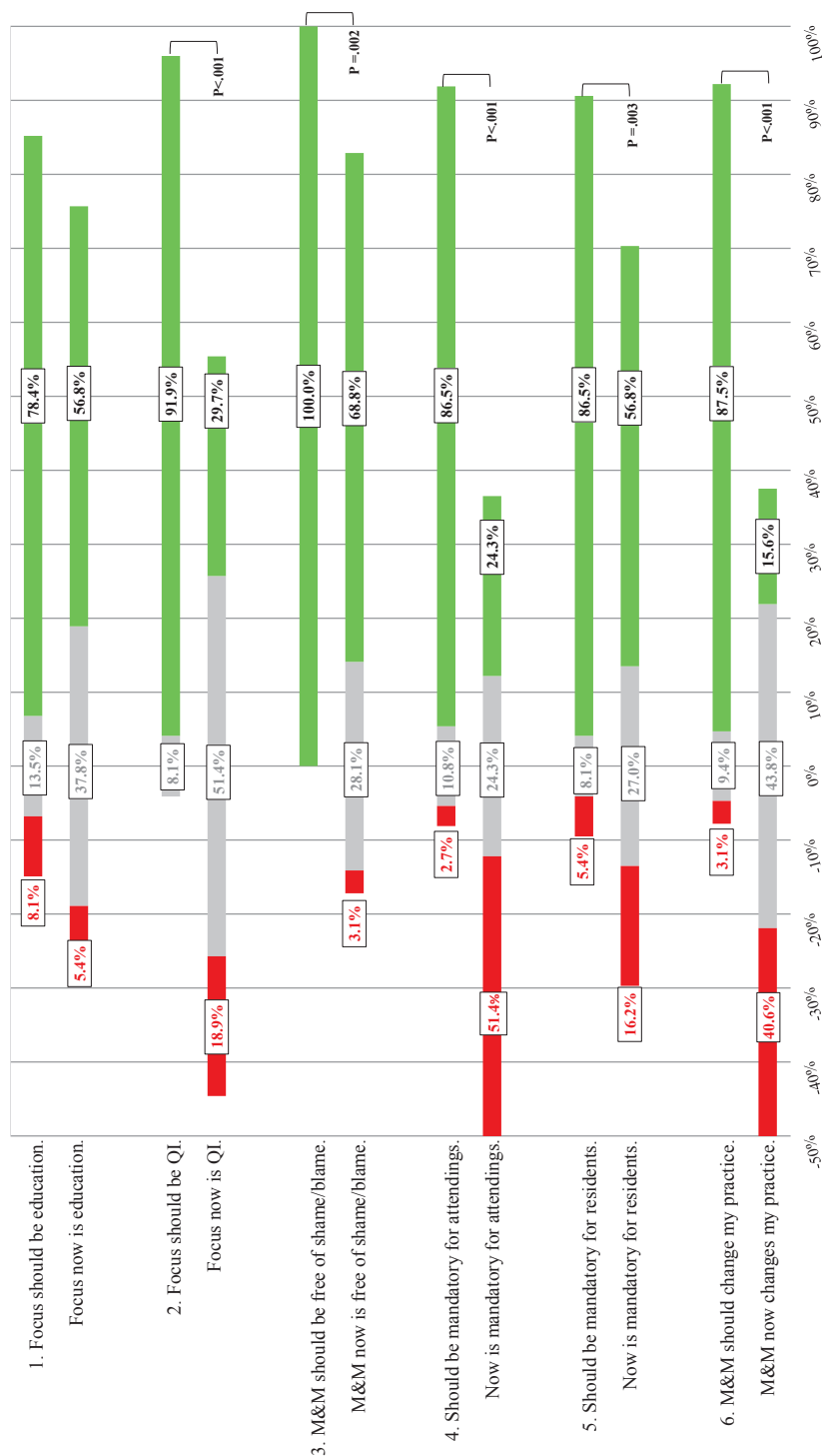
While surveys about M&M have been published before,^{10,20,21} no prior studies have related experiences and (unmet) expectations for key aspects of M&M to observed differences in practice, and descriptions of all key domains of M&M practice are only rarely covered (i.e., goals, structure, process/content).⁷ This mixed methods approach allowed exploring differences and similarities in various aspects of M&M practice as well as participants' perceptions.

Figure 1. Survey responses from Hospital 1 with expectations depicted first and experiences second per statement (full statements in Table 1).



Red, grey and green bars represent negative, neutral and positive responses respectively. Significant differences between proportions are supplemented with P-values.

Figure 2. Survey responses from Hospital 2 with expectations depicted first and experiences second per statement (full statements in Table 1).



Red, grey and green bars represent negative, neutral and positive responses respectively. Significant differences between proportions are supplemented with P-values.

Shared challenges

Most participants reported that M&M was well-focused on education, but expectations were not met for its QI function, in terms of a focus on QI and subsequent changes to clinical practice. This might be related to the observed lack of formal systems for follow-up of QI plans at both hospitals, which might hamper ‘closing the quality loop’ on the individual and system level.^{5,13} Recording and monitoring of plans is associated with increased effectiveness for QI, but often not part of M&M,^{22,23} nor of many other practices for learning and improving in healthcare (e.g., incident reporting), which often lack attention for dissemination, follow-up and feedback.^{13,24–27} Dedicated task groups or committees, as used at Hospital 1, facilitate translating discussions into actual improvements.^{4,9,13,28} This may explain why Hospital 1 respondents more often experienced QI aspects than colleagues at Hospital 2, where such a committee is absent (QI focus: 73% vs. 30%; changes: 44% vs. 16%). However, most participants still expected more from M&M’s function for QI, indicating that both departments could benefit from dedicating time at M&M to tracking prior QI initiatives. To allow time for this form of follow-up, programs could consider limiting the number of cases per conference (as in Hospital 2) or time spent per presentation or discussion (as in Hospital 1).

Similar to many other institutions, both Hospital 1 and 2 only formally require residents to attend. This study revealed, however, that M&M participants also expect mandatory faculty attendance. Unmet expectations for M&M attendance might be related to unmet expectations for the QI function of M&M. Lack of feedback on the changes that result from ideas participants helped generate at M&M, might negatively impact belief in the value of the conference and hence motivation to attend.^{5,13} A prior study revealed that motivations to participate in M&M mostly related to individual or team-based improvement.²¹ When M&M proves useful to its participants, this will likely act as a positive feedback loop²⁸ as well as improve attendance rates.^{8,10} The importance of faculty attendance at M&M has been highlighted in prior studies,^{5,6,22} but actionable recommendations to promote attendance rates are lacking. The present study suggests that sign-in sheets and blocking time in clinic and surgery schedules, used at both hospitals to enhance attendance, may not provide enough incentives, as respondents still supported the statement that faculty attendance should be mandatory. While the expectation of faculty attendance could be made more explicit, feasibility should be carefully examined, as it may interfere with other clinical duties, such as appointments at remote locations of the hospital.

Strengths of different formats

Gaps between expectations and experiences seemed larger at Hospital 2 and were more frequent. Based on our observations, we partly attribute this to the more active role of the moderator in Hospital 1, often considered a key feature of success for M&M.^{6,21,22} As unmet expectations for mandatory attendance for residents were only present at Hospital 2, offering

educational points such as (a local equivalent to) CME credits, as practiced at the Hospital 1, might provide an additional incentive.

Reported success factors were mostly linked to presentations at Hospital 1, and to discussions at Hospital 2, which might also be related to differences in M&M formats. M&M conferences at Hospital 1 include three case presentations, and presenters are always acquainted with cases. Hospital 2, however, allows more time for discussion by only discussing a single case, and uses a round-table setting, which may further increase the focus on the discussion. An optimum balance should be found between time devoted to presentations and discussions, but there is no decisive evidence favoring a certain number of cases.^{6,7,10,23}

Many studies show benefits of using visual aids and standardized formats that include literature and data (e.g., National Surgical Quality Improvement Program).^{12,13,21,23,29} These were used at both sites and might have contributed to the positive results for the educational focus of M&M. Despite that discussion quality was often reported as success factor and despite practical differences (e.g., moderator style, table setting), still 3 out of 10 respondents at both sites reported to only 'sometimes' or 'rarely' experience a conference free of shame and blame, highlighting the difficult and delicate nature of M&M practice.^{2,8,20}

Study strengths and limitations

Strengths of this study include its multi-institutional, multi-national and mixed-methods design with good survey response rates, enabling quantitative and qualitative evaluations of practices for surgical M&M. This study also has important limitations. First, it remains unclear to what extent the findings are generalizable to other institutions. The provided descriptions of M&M practices may help relate the findings to other specific settings (e.g., smaller sized departments may bear more resemblance to Hospital 2). The small survey was deliberately chosen to enhance feasibility, but limits the richness of information. Survey response differences *between* hospitals must be interpreted with caution. The risk of socially desirable answers may be greater at Hospital 1 as a survey in a conference room may feel less anonymous than an online survey, used at Hospital 2. The survey at Hospital 1 was not announced in advance, which strengthens our belief that attendees at this particular conference were an accurate representation of those who usually attend. However, cultural differences may have affected responses to Likert scales as the Dutch are known to express strong opinions,³⁰ while Americans may have a stronger tendency to focus on positive rather than negative aspects.³¹ For these reasons, the two sites were only compared using descriptive statistics and unmet expectations that were identified *within* hospitals.

Future directions

This study suggests additional leads to achieve further gains in M&M practice. To adapt this traditional practice for surgical education to contemporary needs, M&M should be used as a platform for improvement, which further allows M&M to be linked to other ACGME require-

ments such as education on patient safety and QI strategies.^{13,32} To guide efforts towards best practices for M&M, future research should disseminate actionable recommendations on how to best organize M&M with a noticeable QI focus and effect, implement routine tracking of progress and effect of prior actions, and how to achieve (mandatory) faculty attendance.

CONCLUSIONS

Despite well-known practice variation in surgical M&M practice, challenges to meet certain expectations for M&M may be more universal. While only residents were required to attend conferences, M&M participants expected mandatory faculty attendance as well. Expectations for the educational focus of M&M were met, and certain features of M&M seemed beneficial, but expectations were not met for the conference's focus and function for QI at both sites. Greater exchange of best practices could guide improving M&M's function for QI, which includes effecting, as well as demonstrating, its value for improving surgical care.

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APPENDIX

Appendix 1. Descriptions of surgical M&M practices at Brigham and Women's Hospital (BWH) (Hospital 1) and Leiden University Medical Center (LUMC) (Hospital 2).

Divisions

At Hospital 1, the surgical M&M conference usually includes the following divisions: colorectal, vascular, bariatric, trauma, transplant, and minimally invasive surgery, and surgical oncology, with a total of 156 attendings and 88 residents. Attendance data reveal that 58 of these attendings have gone to at least one M&M conference last year, of which a group of 38 regularly. Conferences usually have around 80 participants. Other divisions attend intermittently and not routinely, including cardiac surgery, thoracic surgery, plastic surgery, orthopedic surgery, urology, and ENT. At hospital 2, surgical M&M includes general, colorectal, vascular, trauma, surgical oncology, pediatric and transplant surgery with a total of 25 attendings, 5 physician assistants, and approximately 25 residents, among which all are regular participants of their M&M conference.

Structure

The conferences are planned at the same time every week (Hospital 1) or two weeks (Hospital 2). For the role of moderator, Hospital 1 has designated a single attending surgeon, while all faculty members alternately fulfill this role at Hospital 2. This role is also carried out differently: the Hospital 1 moderator plays a notably more active role in leading the discussion and chairing the meeting compared to moderators at Hospital 2 as he more actively intervenes (using a microphone) to promote interactivity as well as time efficiency.

Case selection

Cases with potential for M&M are reported each week by the senior-most resident or fellow on each service at Hospital 1 via emails to the Surgical Education Office. Their moderator then selects cases for M&M from the list of reported cases. At Hospital 2, residents and physician assistants, under faculty supervision, routinely report all adverse events during hospitalization or at patient discharge into a system for adverse event reporting integrated into the electronic health record (EHR) software. This enables automated selection of cases with severe (i.e., leading to reoperation, irreversible harm or death) or more than two adverse events resulting in a case list with potential cases for M&M. The residents scheduled to present at M&M may select a case, using the case list compiled by the EHR-integrated reporting system or drawing from their own experience, in consultation with the attending assigned as supervisor. Both programs expect the involved attending to be present during presentation of their case. Sometimes conflicts do emerge (e.g., emergency surgery), but presentations are

usually rescheduled if that happens. Involved attendings are also involved during preparation, as resident presenters are supervised by the attending involved in the case or approach him/her to discuss case details in advance of M&M.

Presentations

All presentations are supported by projected slides, following a fixed format that includes a summary of the case followed by a review of literature, published and local data (e.g., using NSQIP Surgical Risk Calculator or local registries). Hospital 1 requires residents to propose a QI project that could address the problem covered in the case. Both hospitals use classification systems for categorization of complications reflecting consequences for the patient: Hospital 1 uses the well-known Clavien-Dindo classification (Dindo D, Demartines N Clavien P-A. Classification of surgical complications: a new proposal with evaluation in a cohort of 6336 patients and results of a survey. *Ann Surg* 2004;240(2):205-13), and Hospital 2 uses the classification of Association of Surgeons of the Netherlands ('NVvH')¹⁵ with four severity levels reflecting consequences for patients, including I: recovery without (re)operation; II: recovery after (re)operation; III (potential) irreversible harm; IV: death. At Hospital 1, the discussion is supplemented (since 6/2015) by an interactive polling system, where the audience members use their cell phones to vote on which factor (e.g., patient, clinician, team, systems, or current medical technology limitations) was the primary contributor to the adverse outcome.

To provide a reference for M&M-derived knowledge, both departments store all M&M presentations in a digital repository. The EHR-embedded system for adverse event reporting at Hospital 2, also allows to log lessons for future patient care that derive from M&M, but these data are not used to track progress of effects of actions. Many members of the dedicated Surgical Quality Improvement Committee, used at Hospital 1, are present at M&M and results of QI initiatives are often presented at subsequent conferences.

