

Discussion of Medical Errors in Morbidity and Mortality Conferences

Edgar Pierluissi, MD

Melissa A. Fischer, MD, MA Ed

Andre R. Campbell, MD

C. Seth Landefeld, MD

RECOGNITION OF THE INEVITABILITY of errors in fields such as aviation, nuclear power generation, and electronics manufacturing has been followed by impressive quality improvement and error reduction.¹ In medicine, incorporation of this knowledge has been slow,² despite the increased attention of professional,³ governmental,⁴ and private⁵ organizations following the 1999 Institute of Medicine⁴ report exposing the magnitude of the medical error problem. These groups believe that increased reporting and study of errors will lead to system improvements and safer health care. Openness to discussion and study of errors, with a realization that "errors must be accepted as evidence of systems flaws, not character flaws"¹ is central to their message.

The morbidity and mortality conference is one of academic medicine's most visible forums for discussion of adverse events and errors.⁶⁻⁸ It is unknown, however, to what extent adverse events and errors are discussed in morbidity and mortality conferences.

We sought to answer the question of whether errors are discussed in medicine and surgery morbidity and mortality conferences. We studied this conference at 4 teaching hospitals affiliated with 2 US medical schools. Our research questions were the following: (1) Are adverse events and errors presented in medicine and surgery morbidity and mortality conferences?

Context Morbidity and mortality conferences in residency programs are intended to discuss adverse events and errors with a goal to improve patient care. Little is known about whether residency training programs are accomplishing this goal.

Objective To determine the frequency at which morbidity and mortality conference case presentations include adverse events and errors and whether the errors are discussed and attributed to a particular cause.

Design, Setting, and Participants Prospective survey conducted by trained physician observers from July 2000 through April 2001 on 332 morbidity and mortality conference case presentations and discussions in internal medicine (n=100) and surgery (n=232) at 4 US academic hospitals.

Main Outcome Measures Frequencies of presentation of adverse events and errors, discussion of errors, and attribution of errors.

Results In internal medicine morbidity and mortality conferences, case presentations and discussions were 3 times longer than in surgery conferences (34.1 minutes vs 11.7 minutes; $P = .001$), more time was spent listening to invited speakers (43.1% vs 0%; $P < .001$), and less time was spent in audience discussion (15.2% vs 36.6%; $P < .001$). Fewer internal medicine case presentations included adverse events (37 [37%] vs 166 surgery case presentations [72%]; $P < .001$) or errors causing an adverse event (18 [18%] vs 98 [42%], respectively; $P = .001$). When an error caused an adverse event, the error was discussed as an error less often in internal medicine (10 errors [48%] vs 85 errors in surgery [77%]; $P = .02$). Errors were attributed to a particular cause less often in medicine than in surgery conferences (8 [38%] of 21 medicine errors vs 88 [79%] of 112 surgery errors; $P < .001$). In discussions of cases with errors, conference leaders in both internal medicine and surgery infrequently used explicit language to signal that an error was being discussed and infrequently acknowledged having made an error.

Conclusions Our findings call into question whether adverse events and errors are routinely discussed in internal medicine training programs. Although adverse events and errors were discussed frequently in surgery cases, teachers in both surgery and internal medicine missed opportunities to model recognition of error and to use explicit language in error discussion by acknowledging their personal experiences with error.

JAMA. 2003;290:2838-2842

www.jama.com

- (2) Are adverse events and errors discussed in these conferences? and
- (3) How are errors discussed in these conferences?

METHODS

We conducted a cross-sectional study of morbidity and mortality conferences in the departments of medicine and surgery at San Francisco General Hospital, San Francisco Veterans Af-

Author Affiliations: San Francisco Veterans Affairs Medical Center (Drs Pierluissi and Landefeld), San Francisco General Hospital (Dr Campbell), and Departments of Surgery (Dr Campbell) and Epidemiology and Biostatistics (Dr Landefeld), School of Medicine, University of California, San Francisco; and Palo Alto Veterans Affairs Medical Center, Stanford University, Palo Alto, Calif (Dr Fischer). Dr Pierluissi is now with San Mateo Medical Center, San Mateo, Calif. Dr Fischer is now with the Division of Primary Care, University of Massachusetts, Worcester.

Corresponding Author and Reprints: Edgar Pierluissi, MD, San Mateo Medical Center, 222 W 39th St, San Mateo, CA 94403 (e-mail: epierluissi@co.sanmateo.ca.us).

fairs Medical Center, University of California at San Francisco Medical Center, and Stanford University Medical Center. Conferences were held weekly or monthly and were attended by medical students, residents, and faculty. We identified 247 consecutive conferences from July 2000 until April 2001; based on availability of a study team member, 151 conferences (61%) were attended, including 66 medicine conferences in which 100 individual cases were presented, and 85 surgery conferences in which 232 individual cases were presented.

Measures

Measures were developed based on the taxonomy and methods of the Harvard Medical Practice Study.⁹ Using structured implicit review, each case presentation and discussion was assessed by a trained physician observer to determine the occurrence of an adverse event, the occurrence of an error, whether the error caused the adverse event, and the scope of discussion. An *adverse event* was defined as an unintentional, definable injury that was the result of medical management and not a disease process. An *error* was defined as the failure of a planned action to be completed as intended or the use of a wrong plan to achieve an aim.¹⁰ The physician observers used a 6-point ordinal scale⁹ to rate the evidence that an adverse event occurred, that an error occurred, and that the error caused the adverse event. For our analysis, we determined that an error caused an adverse event when the observer's judgments of the probability that an adverse event occurred, that an error occurred, and that the error caused the adverse event were each greater than 50%.

A discussion was defined as a meaningful exchange between 2 or more speakers involving a comment, a response, and a follow-up response. A single statement about an error was not considered a discussion. The discussion of error in the conference was classified in 1 of 6 categories: no discussion, explicit discussion (using the words "error," "mistake," or equivalent), im-

plicit discussion (without use of the words "error," "mistake," or equivalent), a disagreement between physicians, a nonspecific problem, or a reasonable choice. When an error was discussed, it was determined whether the participants attributed the error to an individual, a team, a system, or a combination of these.

Physician observers underwent extensive structured training, attended the conferences, applied the measures as described, and collected demographic data on each case including age, sex, and mortality outcome. They also measured time allotted to case presentation, conference leader speaking, invited lecturer speaking, and audience participation.

Medicine conferences were observed by 1 of 4 board-eligible inter-nists, and surgery conferences were observed by 1 of 4 fourth-year surgery residents or a third-year surgery resident. Observer assessments were made after the case presentation and discussion were complete. Because we wished to study what transpired in the conferences alone, observers did not review medical records, participate in the conferences, or discuss cases.

We determined reliability of assessments by measuring interrater agreement among multiple observers at the same conference using the κ statistic. For medicine, 2 to 3 observers simultaneously attended 10 medicine cases; for surgery, 2 to 4 observers simultaneously attended 24 surgery cases. For medicine cases, κ values and agreement were 0.85 (95% confidence interval [CI], 0.35-1.00) and 96% for the presence of an adverse event and 0.78 (95% CI, 0.28-1.00) and 96% for the presence of an error. For surgery cases, κ values and agreement were 0.58 (95% CI, 0.38-0.77) and 89% for the presence of an adverse event and 0.70 (95% CI, 0.50-0.89) and 93% for the presence of an error.

Analysis

Comparisons between departments for categorical variables were made using the χ^2 statistic, with the Fisher exact test

for counts of less than 5. Comparisons with continuous variables were made using the *t* test. Proportions were compared using the *z* test. $P < .05$ was considered significant. Analyses were performed with Stata software, version 6.0 (Stata Corp, College Station, Tex).

This study was performed with approval of the human subjects committees at the participating institutions. Permission to observe and rate the morbidity and mortality conferences was obtained from each department's chair. Conference leaders and participants were aware that the conference was being evaluated but were unaware of the specific evaluation.

RESULTS

Cases presented in medicine and surgery morbidity and mortality conferences, respectively, were similar in mean age (52 and 48 years; $P = .13$), proportion of women (24% and 28%; $P = .47$), and proportion who died (23% and 24%; $P = .82$). On average, fewer cases were presented in medicine conferences than in surgery conferences (1.5 cases vs 2.7 cases; $P = .001$) and the average time spent on each case was 3 times longer for medicine cases (34.1 minutes vs 11.7 minutes; $P = .001$). In medicine conferences, most time was allotted to presenting the case and listening to invited speakers, with relatively little audience participation (TABLE 1). In contrast, surgery conferences focused on case presentation and audience discussion.

Adverse events were present in 37 case presentations (37%) in medicine conferences compared with 166 presentations (72%) in surgery conferences ($P < .001$) (FIGURE). Errors resulting in an adverse event were present in 18 medicine cases (18%) compared with 98 surgery cases (42%; $P = .001$) (Figure). There was no difference in the proportion of adverse events associated with an error in medicine and surgery conferences (48% and 59%, respectively; $P = .24$). Deaths due to an error occurred in 5 medicine cases and 14 surgery cases. Whereas only 11 (52%) of 21 errors presented in

Table 1. Time Apportionment of Cases Presented in Medicine and Surgery Morbidity and Mortality Conferences

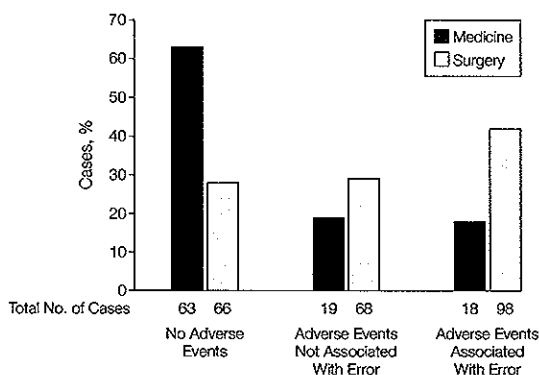
	Mean Time Apportionment of Case Presentations		P Value
	Medicine*	Surgery†	
Presenting case history			
Time, mean, min	9.2	5.6	
Mean % of total conference (95% CI)	26.7 (24.4-28.9)	47.7 (44.3-51.2)	<.001
Conference leader speaking			
Time, mean, min	4.9	1.8	
Mean % of total conference (95% CI)	14.2 (11.5-17.0)	15.4 (12.3-18.4)	.78
Invited lecturer‡			
Time, mean, min	14.8	0	
Mean % of total conference (95% CI)	43.1 (38.8-47.4)	0	<.001
Audience discussion			
Time, mean, min	5.2	4.3	
Mean % of total conference (95% CI)	15.2 (12.6-17.8)	36.6 (32.8-40.3)	<.001
Total audience discussion per conference, mean, min	7.8	11.6	

Abbreviation: CI, confidence interval.

*The following number of cases were observed in medicine conferences (n = 100): hospital 1, 48 cases; hospital 2, 9 cases; hospital 3, 25 cases; and hospital 4, 18 cases.

†The following number of cases were observed in surgery conferences (n = 232): hospital 1, 75 cases; hospital 2, 53 cases; hospital 3, 44 cases; and hospital 4, 60 cases.

‡Invited lecturer refers to a faculty member who is asked to speak at the conference.

Figure. Adverse Events and Errors in Cases Presented in Medicine and Surgery Morbidity and Mortality Conferences

The unit of analysis is the individual case. In 100 medicine case presentations, 37 cases with 43 adverse events were identified; of these 37 cases, 18 cases with 21 errors resulting in 21 adverse events were identified. In 232 surgery case presentations, 166 cases with 191 adverse events were identified; of these 166 cases, 98 cases with 114 errors resulting in 103 adverse events were identified.

Table 2. Discussion of Errors in Medicine and Surgery Morbidity and Mortality Conferences

Discussion	No. (%) of Individual Errors		P Value
	Medicine*	Surgery†	
As an error	10 (48)	85 (77)	.02
Explicitly	4 (19)	35 (32)	
Implicitly	6 (29)	50 (45)	
As other than an error‡	6 (29)	19 (17)	.20
Not discussed	5 (24)	7 (6)	.02

*In the 18 cases with an error-associated adverse event presented in medicine conferences, 21 errors were identified.

†In the 98 cases with an error-associated adverse event presented in surgery conferences, 114 errors were identified; information on participant discussion of error was obtained for 111 of these 114 errors.

‡This category includes errors discussed as disagreements between physicians, as nonspecific problems, and as reasonable choices.

medicine conferences occurred on the medicine service, nearly all errors (106/113 [95%]) presented in surgery conferences occurred on the surgery service ($P < .001$).

Error discussion occurred in 10 (10%) of 100 medicine cases and in 80 (34%) of 232 surgery cases ($P < .001$ for difference between medicine and surgery). In medicine conferences, when errors were presented, they were less likely to be discussed as an error and more likely to be ignored altogether compared with surgery conferences (TABLE 2). In both medicine and surgery conferences, when errors were discussed as errors, only 40% were discussed explicitly. Of the 7 errors associated with 5 deaths in medicine, 3 (43%) were not discussed. Of the 17 errors associated with 14 deaths in surgery, only 1 (6%) was not discussed ($P = .06$). See TABLE 3 for examples of cases with fatal and nonfatal errors.

Of the 10 cases with errors presented and discussed in medicine conferences, 6 contained errors actually occurring on the medicine service. In surgery, 71 of the 80 cases with errors that were presented and discussed actually occurred on the surgery service.

Medicine conference leaders acknowledged having made an error during a discussion of a case with an error somewhat less often than did surgery conference leaders (1/18 cases vs 24/98 cases, respectively; $P = .12$).

Errors were attributed to an individual, team, or system less often in medicine conferences (8/21 errors [38%]) than in surgery conferences (88/112 errors [79%]; $P < .001$). In medicine, 7 (88%) of 8 error attributions included the team or the system and only 1 was thought to be due solely to an individual (TABLE 4). In surgery, 56 (64%) of 88 included the team or the system and one third were thought to be due solely to an individual. This difference was not statistically significant ($P = .17$).

COMMENT

We found differences between internal medicine and surgery conferences in format, frequency of adverse events and

errors in cases presented, discussion of adverse events and errors resulting in an adverse event or patient death, and attribution of errors to a particular cause. Internal medicine conferences were lecture based, with relatively little discussion. Cases with adverse events and errors were infrequently presented and, when presented, were discussed as an error only half of the time. Thus, a resident attending 48 medicine morbidity and mortality conferences in a year would observe only 7 error discussions on average, since each conference presented an average of 1.5 cases and an error was discussed in 10% of cases. Errors were attributed to a cause in less than half of the cases, with an emphasis on team and system causes of the error.

Surgery conferences focused on case presentation and audience discussion. Most cases presented had an adverse event that was often associated with error. When a case with an adverse event and error was presented, it was almost always discussed as an error. Thus, a resident attending 48 surgery morbidity and mortality conferences in a year would observe 44 error discussions on average, since each conference presented an average of 2.7 cases and an error was discussed in 34% of cases. Errors were attributed to a particular cause, with one third of errors attributed solely to an individual. In both medicine and surgery conferences, errors were infrequently discussed explicitly, and leaders infrequently acknowledged ever having made an error.

Our findings contrast with the beliefs of internal medicine residency directors, as recently reported by Orlander et al.⁷ More than 80% of 295 responding internal medicine program directors reported that morbidity and mortality "cases were most often selected because of unexpected adverse events or suspected error" and "that when present, medical error was discussed with moderate to high success". This may reflect the difference between desired rather than actual performance in presenting and discussing errors. Our results are, however, consistent with previous studies of self-reported errors¹¹⁻¹³ and socio-

Table 3. Characteristics of Cases Illustrating Fatal and Nonfatal Errors Presented in Medicine and Surgery Morbidity and Mortality Conferences*

		Discussion of Error†
Fatal Errors		
Medicine conference		
Inappropriate monitoring of anticoagulation resulting in epistaxis		Discussed, not as error
Inappropriate treatment of epistaxis resulting in respiratory compromise		Not discussed
Delay in intubation		Discussed as error
Surgery conference		
Inadequate antacid treatment		Discussed as error
Technical error in gastric bypass procedure resulting in perforated gastric ulcer, intra-abdominal abscesses, and sepsis		Discussed as error
Nonfatal Errors		
Medicine conference		
Delay in diagnosing epidural abscess resulting in bilateral lower extremity hemiplegia		Not discussed
Surgery conference		
Fascial suture through bowel loops resulting in complete bowel obstruction requiring reoperation		Discussed as error

*In the examples shown for each type of error in each type of conference, errors were identified in a single case presentation involving a single patient.

†Discussion of error refers to the observer's determination of whether the conference participants discussed the error. "Discussed as error" includes both explicit and implicit error discussions (see "Methods" section of text for details). "Discussed, not as error" includes discussions in which the identified error was discussed by the conference participants as a nonspecific problem, a reasonable choice, or a disagreement between physicians. "Not discussed" means the error did not meet criteria for a discussion as defined in the "Methods" section of text.

logical studies of internal medicine residents^{14,15} and surgeons.¹⁶

Why is it important that adverse events and errors are presented and discussed? Discussion of errors with the goal of learning how to prevent them underlies the tradition of the morbidity and mortality conference^{7,8,17} and is supported by principles of adult learning.¹⁸⁻²⁰ Open discussion of errors may enhance error reporting²¹ and, thus, promote patient safety. Increased error reporting has led to safety improvements in other industries and is promoted by leaders in the fields of medicine and safety.¹ Furthermore, as systems of care become targets for improvement, increased attention to physician competency in assessing system contribution to errors becomes more important. In fact, morbidity and mortality conferences are unrealized opportunities to provide residents with experiences that help develop competency in all 6 core areas required by the Accreditation Council for Graduate Medical Education (ACGME), including systems-based practice, practice-based learning and improvement, professionalism, and communication.²² Modeling error disclosure in a supportive, nonblaming en-

Table 4. Attribution of Errors in Medicine and Surgery Morbidity and Mortality Conferences

Error Attribution	Medicine, No.*	Surgery, No.†
Single cause		
Individual	1	32
Team	2	21
System	1	10
Two causes		
Individual and team	3	19
Individual and system	0	1
Team and system	1	1
All 3 causes	0	4

*Of 21 errors in medicine conferences, 8 were attributed by discussants.

†Of 112 errors in surgery conferences, 88 were attributed by discussants.

vironment may benefit residents by training them for successful personal management of this intrinsic challenge of medical practice.^{7,12,13,23-25} As a profession, physicians are entrusted with monitoring and improving the quality of the medical care they provide.^{26,27} This responsibility includes identifying and remedying those services and procedures that threaten patient safety. Error discussion is a vital aspect of fulfilling this responsibility.²⁸

The paucity of adverse event and error presentation and discussion in internal medicine compared with sur-

gery is likely related to regulatory and cultural factors. The ACGME,²² the only national organization that addresses whether a morbidity and mortality conference should occur and what should take place during the conference, requires that surgery morbidity and mortality conferences present and discuss "all deaths and complications that occur on a weekly basis." There is no similar requirement for internal medicine. Without a specific requirement to do so, adverse events and errors occurring in the medicine service are not generally discussed. Moreover, our findings support a preference to present and discuss errors occurring in other services. The culture of internal medicine still "seems to have no place for its errors."²⁹

Our findings demonstrate important cultural differences between internal medicine and surgery and missed opportunities for learning to improve

patient care. For departments of medicine, efforts to ensure that adverse events and errors are presented and discussed with a view to improving systems and enhancing disclosure may be especially valuable. Departments of surgery are fulfilling their mandate to present and discuss adverse events and errors but may overemphasize the role of the individual and underemphasize underlying system defects. In both departments, conference leaders have the opportunity to model error acknowledgment and use explicit language in error discussion more frequently and ensure that efforts are clearly linked to education and local improvement activities.

Author Contributions: Dr Pierluissi had full access to the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analyses.

Study concept and design: Pierluissi, Fischer, Campbell, Landefeld.
Acquisition of data: Pierluissi, Fischer, Campbell.
Analysis and interpretation of data: Pierluissi, Fischer, Campbell, Landefeld.

Drafting of the manuscript: Pierluissi, Fischer, Campbell, Landefeld.

Critical revision of the manuscript for important intellectual content: Pierluissi, Fischer, Campbell, Landefeld.

Obtained funding: Landefeld.

Administrative, technical, or material support: Pierluissi, Fischer, Campbell.

Study supervision: Campbell, Landefeld.

Funding/Support: This work was supported in part by grants to the University of California, San Francisco, from the National Institute on Aging (grant K-07 AG00912), the John A. Hartford Foundation (grant 2000-0455), and Dartmouth College, and by a grant to Dartmouth College from the Pfizer Foundation. Dr Pierluissi was a fellow with the VA National Quality Scholars Program and Dr Fischer held a VA Fellowship in Ambulatory Care Practice and Research at the time of the study.

Role of the Sponsor: The sponsors had no role in the conception or design of the study; collection, analysis, or interpretation of the data; or drafting or revision of the manuscript.

Previous Presentation: Parts of this work were presented at the annual meeting of the Society of General Internal Medicine, May 3, 2001, San Diego, Calif.

Acknowledgment: We thank the physician observers, David S. Chang, Scott L. Hansen, Jade S. Hiramoto, Michelle L. Li, Douglas Miniati, Erwin S. Tan, and Michael A. Steinman for their contributions to this project. We are grateful for the support of the chairs of the departments of medicine and surgery that participated in this study and to the many physicians and scientists who contributed to this study.

REFERENCES

1. Leape LL. Error in medicine. *JAMA*. 1994;272:1851-1857.
2. Boodman SG. No end to errors. *Washington Post*. December 3, 2002;HE01.
3. National Patient Safety Foundation home page. Available at: <http://www.npsf.org/>. Accessed March 13, 2003.
4. Institute of Medicine. *To Err Is Human: Building a Safer Health System*. Washington, DC: National Academy Press; 1999.
5. National Quality Forum home page. Available at: <http://www.qualityforum.org/>. Accessed March 13, 2003.
6. Harbison SP, Regehr G. Faculty and resident opinions regarding the role of morbidity and mortality conference. *Am J Surg*. 1999;177:136-139.
7. Orlander JD, Barber TW, Fincke BG. The morbidity and mortality conference: the delicate nature of learning from error. *Acad Med*. 2002;77:1001-1006.
8. Gordon LA. *Gordon's Guide to the Surgical Morbidity and Mortality Conference*. Philadelphia, Pa: Hanley & Belfus; 1994.
9. Brennan TA, Leape L, Laird NM, et al. Incidence of adverse events and negligence in hospitalized patients: results of the Harvard Medical Practice Study I. *N Engl J Med*. 1991;324:377-384.
10. Reason J. *Human Error*. New York, NY: Cambridge University Press; 1990.
11. Christensen JF, Levinson W, Dunn PM. The heart of darkness: the impact of perceived mistakes on physicians. *J Gen Intern Med*. 1992;7:424-431.
12. Wu AW, Folkman S, McPhee SJ, Lo B. Do house officers learn from their mistakes? *JAMA*. 1991;265:2089-2094.
13. Newman MC. The emotional impact of mistakes on family physicians. *Arch Fam Med*. 1996;5:71-75.
14. Stelling J, Bucher R. Vocabularies of realism in professional socialization. *Soc Sci Med*. 1973;7:661-675.
15. Mizrahi T. Managing medical mistakes: ideology, insularity, and accountability among internists-in-training. *Soc Sci Med*. 1984;19:135-146.
16. Bosk CL. *Forgive and Remember: Managing Medical Failure*. Chicago, Ill: University of Chicago Press; 1979.
17. Blumenthal D. Making medical errors into medical "treasures." *JAMA*. 1994;272:1867-1868.
18. Perkinson HJ. Learning from our mistakes. *Et Cetera*. 1979;36:37-57.
19. Bransford J, Brown AL, Cocking RR, eds, for the National Research Council. *How People Learn: Brain, Mind, Experience and School*. Washington, DC: National Academy Press; 2000.
20. Knowles MS, Holton EF, Swanson RA. *The Adult Learner: The Definitive Classic in Adult Education and Human Resource Development*. Houston, Tex: Gulf Publishing Co; 1998.
21. Volpp KG, Grande D. Residents' suggestions for reducing errors in teaching hospitals. *N Engl J Med*. 2003;348:851-855.
22. *Graduate Medical Education Directory 2002-2003*. Chicago, Ill: American Medical Association; 2002.
23. Wu AW. Medical error: the second victim. *BMJ*. 2000;320:726-727.
24. Croskerry P. The feedback sanction. *Acad Emerg Med*. 2000;7:1232-1238.
25. Gallagher TH, Waterman AD, Ebers AG, Fraser VG, Levinson W. Patients' and physicians' attitudes regarding the disclosure of medical errors. *JAMA*. 2003;289:1001-1007.
26. Brennan TA. Physician's professional responsibility to improve the quality of care. *Acad Med*. 2002;77:973-980.
27. Becher EC, Chassin MR. Taking health care back: the physician's role in quality improvement. *Acad Med*. 2002;77:953-962.
28. Smith ML, Forster HP. Morally managing medical mistakes. *Camb Q Healthc Ethics*. 2000;9:38-53.
29. Hilfiker D. Facing our mistakes. *N Engl J Med*. 1984;310:118-122.