

Reporting Medical Errors to Improve Patient Safety

A Survey of Physicians in Teaching Hospitals

Lauris C. Kaldjian, MD, PhD; Elizabeth W. Jones, MHSA; Barry J. Wu, MD; Valerie L. Forman-Hoffman, PhD, MPH; Benjamin H. Levi, MD, PhD; Gary E. Rosenthal, MD

Background: Collecting data on medical errors is essential for improving patient safety, but factors affecting error reporting by physicians are poorly understood.

Methods: Survey of faculty and resident physicians in the midwest, mid-Atlantic, and northeast regions of the United States to investigate reporting of actual errors, likelihood of reporting hypothetical errors, attitudes toward reporting errors, and demographic factors.

Results: Responses were received from 338 participants (response rate, 74.0%). Most respondents agreed that reporting errors improves the quality of care for future patients (84.3%) and would likely report a hypothetical error resulting in minor (73%) or major (92%) harm to a patient. However, only 17.8% of respondents had reported an actual minor error (resulting in prolonged treatment or discomfort), and only 3.8% had re-

ported an actual major error (resulting in disability or death). Moreover, 16.9% acknowledged not reporting an actual minor error, and 3.8% acknowledged not reporting an actual major error. Only 54.8% of respondents knew how to report errors, and only 39.5% knew what kind of errors to report. Multivariate analyses of answers to hypothetical vignettes showed that willingness to report was positively associated with believing that reporting improves the quality of care, knowing how to report errors, believing in forgiveness, and being a faculty physician (vs a resident).

Conclusion: Most faculty and resident physicians are inclined to report harm-causing hypothetical errors, but only a minority have actually reported an error.

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Author Affiliations: Division of General Internal Medicine, Department of Internal Medicine (Drs Kaldjian, Forman-Hoffman, and Rosenthal and Ms Jones) and Program in Biomedical Ethics and Medical Humanities (Dr Kaldjian), University of Iowa Roy J. and Lucille A. Carver College of Medicine, and Center for Research in the Implementation of Innovative Strategies in Practice, Iowa City Veterans Affairs Medical Center (Drs Kaldjian, Forman-Hoffman, and Rosenthal and Ms Jones), Iowa City; Departments of Internal Medicine, Hospital of St Raphael and Yale University School of Medicine, New Haven, Connecticut (Dr Wu); and Departments of Humanities and Pediatrics, Penn State College of Medicine and Hershey Medical Center, Hershey, Pennsylvania (Dr Levi). Ms Jones is now with the Virginia Department of Social Services, Richmond.

TO IMPROVE PATIENT SAFETY, it is necessary to understand the frequency, seriousness, and causes of medical errors.¹⁻⁸ Such knowledge is acquired by the analysis of data collected through error-reporting systems. These systems may be internal or external to health care institutions and may be voluntary or mandatory.⁹ Whatever their particular design, at the ground level of clinical practice, such reporting relies on a professional culture in which physicians and other health care providers view error disclosure as an integral part of learning and quality improvement.^{4,10-12} It is also important to consider how reporting errors to institutions to enhance patient safety may differ from disclosing errors to patients as part of direct patient care.¹³

Despite recent professional and legislative efforts to encourage error reporting,^{9,14} including the passage of the Patient Safety and Quality Improvement Act of 2005,¹⁵ it is not clear whether error reporting has become more common since the Institute of Medicine published its seminal report, *To Err Is Human: Building a Safer Health System*,

in 2000.¹⁶⁻¹⁸ Obstacles to reporting are diverse and daunting,^{19,20} and underreporting of errors is believed to be pervasive.^{9,21} Because error surveillance systems generally rely on self-reporting,²² it is important to understand the factors that continue to impede reporting, as well as those that may facilitate it. To improve our knowledge about error reporting, we conducted a survey of physicians in teaching hospitals. We chose this setting because of the influence teaching hospitals may have on trainees' attitudes toward error reporting and patient safety.

METHODS

PARTICIPANTS

Faculty and resident physicians were drawn from 3 medical centers located in the midwest, mid-Atlantic, and northeast regions of the United States. Surveys were completed from June 1 through September 30, 2004, with the exception of 32 resident physicians and 51 faculty physicians at 1 study site who completed surveys from January 1 through March 31, 2005. Two of the 3 states in which the study was conducted enacted mandatory error reporting legislation in 2002; the third state had

no such legislation.²³ All participating hospitals had error reporting systems in place for clinicians during the study.

After approval by the institutional review boards at each of the participating institutions, potential participants were invited to complete a self-administered, paper-based survey as previously described.¹³ No personal identifying information was collected, and participants were assured that they and their institutions would remain anonymous.

Resident physicians were from the disciplines of family medicine, internal medicine, and pediatrics. Faculty physicians were from the disciplines of family medicine, general internal medicine, and general pediatrics, with the addition of 36 pediatric specialists from 1 study site. The pediatric specialists were surveyed as a comparison group to contrast with the generalist faculty physicians. When all variables were analyzed for differences, responses from pediatric specialists were not significantly different from generalist faculty responses, so their responses were included for analysis.

SURVEY QUESTIONNAIRE

Actual experiences with errors and disclosure were queried by asking if the respondents had ever made a mistake that (1) prolonged treatment or caused discomfort or (2) caused disability or death. In each case, they were asked whether they had reported or not reported the error to their institution.

To assess respondents' willingness to disclose errors, we used a hypothetical error vignette similar to that used by Blendon et al,²⁴ followed by 3 different outcomes of varying severity (no harm, minor harm, and major harm) (**Figure**). The question at the end of each outcome was followed by response options of very likely, likely, not sure, unlikely, and very unlikely. A modified version of the hypothetical vignette and responses was given to the pediatric faculty and residents by changing the patient to a 7-year-old boy and adjusting the third clinical outcome by making no mention of a myocardial infarction and concluding that "the patient's condition stabilizes and he is transferred out of the intensive care unit after 24 hours."

Questions concerning knowledge and attitudes toward error reporting were based on an empirically derived taxonomy of factors that facilitate and impede disclosure and were designed to probe the domains of responsibility to community, attitudinal barriers, uncertainties, helplessness, and fears and anxieties.¹⁹ Attitudinal questions used 5-point Likert scale responses ranging from strongly agree to strongly disagree.

Demographic variables included training level, specialty, sex, belief in forgiveness, experience giving medicolegal testimony, and being named as a defendant in a malpractice case. To ensure the anonymity of responses, we did not query age, year of graduation, or race/ethnicity.

Based on previous focus group data, we did not make a distinction between *medical error* and *medical mistake* and printed the following statement in the questionnaire: "We use 'medical error' and 'medical mistake' interchangeably to describe a preventable adverse event that affects a patient by prolonging treatment or causing discomfort, disability, or death."

The questionnaire was pilot tested for face validity, clarity, and stability over time with 16 participants. Two rounds of identical surveys were distributed to these participants, separated by 2 weeks. Based on the stability of each item (calculated using the Spearman correlation of each individual's response at times 1 and 2), 1 question was clarified and 17 questions were removed. Items that had a correlation coefficient of less than 0.50 were not included in the final questionnaire. All of the final questions had good to excellent reliability, with a Spearman $\rho \geq 0.6$.²⁵ (The questionnaire is available on request from the first author.)

A 67-year-old man is admitted at night to your hospital service for treatment of pneumonia. He has an allergy to cephalosporin antibiotics, which is noted in his medical record. At the time of the interview and examination, you forget to ask him about allergies, and in your efforts to expedite the start of his treatment you do not notice the antibiotic allergy documented in his medical record. You write an order for a cephalosporin antibiotic and a nurse gives the drug to the patient, intravenously.

Outcome 1 (no harm):

The next morning on rounds, you notice his cephalosporin allergy in the medical record. You are relieved to find that the patient has no new complaints and there is no evidence of an allergic reaction. You discontinue the cephalosporin and order an alternative antibiotic. The patient gives no indication that he is aware of any problems in his care. In this scenario, how likely is it that you would report this event to your hospital as an error?

Outcome 2 (minor harm):

The next morning on rounds, the patient is moderately uncomfortable due to diffuse itching and has a rash all over his body. You discontinue the cephalosporin, order an alternative antibiotic, and the patient recovers fully from the drug reaction over the next 3 days. In this scenario, how likely is it that you would report this event to your hospital as an error?

Outcome 3 (major harm):

Two hours after you admit the patient to the hospital, you receive a call from the ward nurse. The nurse explains that half an hour after the cephalosporin was administered, the patient was found to be in respiratory distress and then anaphylactic shock. Cardiopulmonary resuscitation was administered and the patient was transferred to the intensive care unit. Subsequent cardiac testing shows that a moderate myocardial infarction has occurred. The patient's condition stabilizes and he is transferred out of the intensive care unit after 3 days. In this scenario, how likely is it that you would report this event to your hospital as an error?

Figure. A hypothetical clinical vignette with outcomes of varying severity. The vignette was modified for pediatric faculty and residents, as described in the "Survey Questionnaire" subsection of the "Methods" section, and is presented verbatim.

STATISTICAL ANALYSIS

Answers from the questionnaires were entered into an Access data file and uploaded into SAS statistical software (PC SAS, version 8.1; SAS Institute Inc, Cary, North Carolina). Likert scale responses were dichotomized as follows: (1) likely/very likely vs not sure/unlikely/very unlikely, and (2) agree/strongly agree vs neutral/disagree/strongly disagree. By grouping undecided and negative responses together, this dichotomization placed primary analytic focus on positive responses. To simplify reporting in the "Results" section, *likely* signifies the combination of "likely" and "very likely" responses, and *agree* signifies the combination of "agree" and "strongly agree" responses.

We calculated frequency distributions of responses and used the 2-tailed Fisher exact test or the χ^2 statistic to test differences between proportions. For multivariate analysis, 7 knowledge and attitudinal variables and 6 demographic variables (training level, specialty, sex, belief in forgiveness, experience giving medicolegal testimony, and being named as a defendant in a malpractice case) served as independent variables, and answers to the hypothetical vignettes served as dependent variables. Independent variables that were significant ($P < .10$) in bivariate analyses were entered into a backward stepwise logistic regression model, with a stay criterion of $P < .10$, for each of the hypothetical vignettes. Once a final set of predictor variables was established, models were adjusted for any differences between sites.

RESULTS

RESPONSE RATES AND DEMOGRAPHIC CHARACTERISTICS

Surveys were completed by 138 faculty physicians and 200 resident physicians. The overall response rate was 74.0%, with subgroup response rates of 81.7% (faculty) and 69.4% (residents). **Table 1** describes respondents' demographic characteristics.

Table 1. Respondents' Demographic Characteristics

Characteristic	Finding
Response rate, %	74
Total No. of Specialty Faculty	138
Internal medicine	53
Family medicine	21
Pediatrics	64
Total No. of Residents	200
Internal medicine	135
Family medicine	12
Pediatrics	53
Women, %	51.2
Religiosity/spirituality, %	
Moderately or very religious ^a	55.4
Moderately or very spiritual ^a	71.3
Attend religious meetings a few times a month or more	45.1
Forgiveness is an important part of my spiritual/religious belief system	84.2
Proportion of professional time spent in direct patient care, % ^b	
1-20	6
21-40	16
41-60	22
61-80	28
≥81	28
Type of clinical practice, % ^b	
All outpatient	14
Mostly outpatient	51
Equally outpatient and inpatient	10
Mostly inpatient	16
All inpatient	9
Experience with medicolegal proceedings, %	
Have provided medical testimony in a legal deposition that was related to a malpractice case	
Faculty	36.8
Residents	0.5
Have been named as a defendant in a malpractice case	
Faculty	22.2
Residents	0.5

^a Respondents were asked "To what extent do you consider yourself a religious person?" and "To what extent do you consider yourself a spiritual person?"

^b Indicates question posed to faculty only.

REPORTING ACTUAL ERRORS

Among the 338 respondents, 17.8% acknowledged reporting a minor error (prolonging treatment or causing discomfort), and 3.8% acknowledged reporting a major error (causing disability or death), as shown in **Table 2**. Conversely, 16.9% of respondents acknowledged not reporting a minor error, and 3.8% acknowledged not reporting a major error. There was minimal overlap between respondents who did and did not acknowledge reporting errors; 16 respondents acknowledged that they both reported and did not report minor errors, and 2 respondents acknowledged that they both reported and did not report major errors. Taking all acknowledged errors together (reported and not reported), 35.6% of respondents (50.9% of faculty and 25.8% of residents) acknowledged having made at least 1 minor or 1 major error, with 34.7% acknowledging a minor error and 7.5% acknowledging a major error.

Table 2. Actual Experiences With Reporting and Nonreporting of Errors

Question ^a	Respondents Answering Yes, No. (%)
Minor errors	
Have you ever made a mistake that prolonged treatment or caused discomfort and reported the mistake to your institution?	
Faculty	33 (23.9)
Residents	27 (13.5)
Total	60 (17.8)
Have you ever made a mistake that prolonged treatment or caused discomfort and not reported the mistake to your institution?	
Faculty	31 (22.5)
Residents	26 (13.0)
Total	57 (16.9)
Major errors	
Have you ever made a mistake that caused disability or death and reported the mistake to your institution?	
Faculty	11 (8.0)
Residents	2 (1.0)
Total	13 (3.8)
Have you ever made a mistake that caused disability or death and not reported the mistake to your institution?	
Faculty	9 (6.5)
Residents	4 (2.0)
Total	13 (3.8)

^a Survey questions are presented verbatim.

Table 3. Responses to Hypothetical Error Vignette^a

How Likely Is It That You Would Report the Error?	Outcome 1: No Harm, %	Outcome 2: Minor Harm, %	Outcome 3: Major Harm, %
Very likely	20	45	76
Likely	23	28	16
Not sure	24	15	5
Unlikely	24	9	2
Very unlikely	9	3	1

^a See the Figure for details of the hypothetical vignette.

REPORTING HYPOTHETICAL ERRORS

The likelihood of reporting a hypothetical error depended on the outcome of the error. Of the respondents, 92% indicated that they would report a hypothetical error if it resulted in major harm, 73% if it resulted in minor harm, and 43% if it resulted in no harm (**Table 3**).

KNOWLEDGE AND ATTITUDES REGARDING ERROR REPORTING

As shown in **Table 4**, most physicians believed that reporting errors improves the quality of care for future patients, but only 54.8% knew how to report errors to their

Table 4. Knowledge and Attitudes Regarding Error Reporting

Question ^a	% Who Agreed			P Value
	Total	Faculty	Residents	
Reporting medical errors to one's own institution improves the quality of care for future patients	84.3	82.5	85.5	.45
I know how to report medical errors to my institution	54.8	62.3	49.5	.02
I know what kinds of medical errors should be reported to my institution	39.5	53.6	30.0	<.001
It is hard to be certain about the true causes of adverse events in the practice of clinical medicine	62.8	64.2	61.8	.68
I would be more likely to report errors to my institution if I knew I would receive feedback afterwards	47.9	41.3	52.5	.04
Disclosing errors to my institution isn't worth my time because my actions can't change the system of care	7.4	11.0	5.0	.04
In general, when thinking about disclosing medical mistakes, I am concerned about professional discipline	57.7	45.7	66.3	<.001

^aSurvey questions are presented verbatim.

Table 5. Variables Associated With Hypothetical Error Reporting in Multivariable Analyses

Variable	Hypothetical Error Reporting, OR (95% CI)		
	No Harm	Minor Harm	Major Harm
Reporting errors improves the quality of care	3.98 (1.66-9.52)	4.03 (2.08-7.80)	NS ^a
I know how to report errors	2.35 (1.40-3.94)	3.88 (2.20-6.83)	2.45 (0.97-6.14)
Reporting errors isn't worth my time because my actions can't change the system of care	0.20 (0.04-0.98)	NS ^a	0.23 (0.07-0.72)
Faculty (vs residents)	1.65 (0.98-2.80)	NS ^a	2.69 (0.91-7.98)
Forgiveness is an important part of my spiritual or religious belief system	2.94 (1.39-6.23)	2.17 (1.10-4.27)	NS ^a

Abbreviations: CI, confidence interval; NS, nonsignificant; OR, odds ratio.

^aIndicates NS at the level of $P < .10$.

institution and only 39.5% knew what kind of errors should be reported. Many respondents believed that it is hard to be certain about the true causes of adverse events, but few believed that reporting errors was not worth their time. The anticipation of feedback would make 47.9% of the respondents more likely to report errors, and 57.7% acknowledged concerns about professional discipline when thinking about disclosing errors in general. Resident physicians were less knowledgeable than faculty about how to report errors and what errors to report, and they were generally more concerned about professional discipline when disclosing errors.

VARIABLES ASSOCIATED WITH REPORTING HYPOTHETICAL ERRORS

Respondents who had actually reported a minor error were more likely to indicate they would report a hypothetical error resulting in no harm (58.3% vs 38.7%; $P = .006$), minor harm (88.3% vs 68.3%; $P = .002$), and major harm (100% vs 90.9%; $P = .02$). Similar differences were found for respondents who had actually reported an error that resulted in major harm, although these differences did not reach statistical significance ($P < .05$).

Multivariate analyses were performed to create models for each of the 3 outcomes of the error (no harm, minor harm, and major harm). Five variables were found

to be significant ($P < .10$) in 1 or more of the 3 models, as shown in **Table 5**. Respondents were more likely to report errors if they knew how to report them or believed that error reporting improves the quality of care, and they were less likely to report errors if they believed that reporting them was not worth their time. Faculty physicians were more likely than residents to report errors, and respondents for whom forgiveness was important were also more likely to report errors. Neither sex nor exposure to malpractice was associated with differences in the likelihood of reporting any of the hypothetical errors, and only 1 variable dropped out of 1 model after adjusting for site differences (an association between specialty and reporting an error resulting in no harm).

COMMENT

The results of this study make important contributions to a limited empirical literature on physician reporting of medical errors to improve patient safety. Our data provide new information from teaching hospitals about attitudes toward reporting, actual practices, and the potential influence of demographic factors such as level of training and beliefs about forgiveness. Particularly notable was the finding that although most of our respon-

dents indicated they would likely report to their institutions a hypothetical error resulting in minor or major harm to a patient, only 17.8% acknowledged ever reporting an actual minor error, and only 3.8% acknowledged ever reporting an actual major error. Furthermore, 16.9% of respondents acknowledged not reporting an actual minor error and 3.8% acknowledged not reporting an actual major error. Taken together, these results suggest there may be a gap between attitude and practice among physicians regarding the reporting of medical errors.

If true, such a gap between attitude and practice in reporting errors has significant implications for efforts to improve patient safety and the quality of care. Although research has not yet demonstrated a clear link between reporting, intervention, and improved outcomes,²⁶ the patient safety movement reasonably assumes that a better understanding of errors and their causes will lead to a reduction in their frequency. Our study was premised on the belief that error reports by physicians represent an important source of information from the front lines of care. If a substantial number of physicians are not reporting errors, efforts to improve patient safety may be handicapped.

One reason for underreporting errors may be a lack of knowledge: only 62.3% of faculty and 49.5% of residents knew how to report errors. The implications of this knowledge deficit are suggested by our multivariate analyses: respondents who knew how to report errors were 2 or 3 times more likely to report hypothetical errors. Knowledge about how to report errors is essential, especially in a training environment in which trainees need to observe a connection between institutional messages about the importance of reporting and clinical practices that make such messages credible. Another reason for underreporting may be lack of knowledge about what should be reported: only 53.6% of faculty and 30.0% of residents believed they knew what kinds of errors to report. Institutions should provide guidelines for reporting²⁷ to help clinicians identify errors that are most likely to have significance for patient safety, and the ideal of comprehensive reporting should be balanced against opportunity costs to clinicians and data analysts.

Another source of underreporting may arise from reliance on error outcomes to decide whether an error should be reported. By using hypothetical vignettes with outcomes of variable seriousness, we found that many clinicians associate the need for error reporting with the severity of error outcome. This approach to error reporting fails to appreciate that many significant errors may not result in harm. Such errors—known as near misses—represent important opportunities to learn from mistakes that have not affected patients.^{17,28-30} Our hypothetical results are consistent with actual reporting patterns observed among physicians in intensive care units who report near misses less frequently than they report errors resulting in harm.³¹ Near misses may represent an underused resource for learning and improvement.

The need for a tangible connection between error reporting and improved patient care is suggested by our finding that more than half of respondents stated they would be more likely to report errors if they knew they would receive feedback afterward. Institutions can send

important signals to those who report errors by acknowledging reports soon after they are submitted and, once assessed, informing the reporter how the report contributed (or is expected to contribute) to patient safety.^{21,29} Such information can help physicians see error reporting as a clinically relevant, institutionally valued, and effective activity.

Questions about legal liability regularly arise in discussions about error reporting because of concerns that reported information may be discoverable in a malpractice proceeding.^{9,17,18,32} In response to such concerns, leaders recommend that error reporting systems be confidential.⁹ Our study did not find that respondents who had been exposed to malpractice litigation were any less likely to report hypothetical errors. This negative finding in a relatively small study sample should be interpreted cautiously, and it does not address the general inhibitory effect on error reporting that may be exerted by fears of legal liability. There remain compelling reasons for legislation to protect physicians under the umbrella of peer review by making the reporting and discussion of errors privileged.³³ Such legislation can reassure wary physicians that their conscientious efforts to improve the quality of health care will not be used against them. The Patient Safety and Quality Improvement Act¹⁵ represents important progress in addressing such concerns.

Advocates of patient safety have rightly called for the removal of blame and shame from the reporting of medical errors.^{1,10} In the effort to avoid casting blame, however, institutions need to recognize that feelings of guilt after an error may nevertheless be very real for physicians.¹³ Guilt feelings after errors may be related to a compulsive mindset that automatically views bad outcomes as failures,³⁴ and their presence emphasizes the need for empathy.³⁵ Related to this, our results suggest there may be connections between physicians' beliefs about forgiveness and their willingness to report errors. Respondents who agreed that forgiveness is an important part of their belief system were more than twice as likely to report a hypothetical error resulting in no harm or in minor harm. Although forgiveness is typically discussed in the context of disclosing errors to patients,^{36,37} these data suggest that forgiveness may also be relevant to reporting errors to institutions, at least among some physicians.

Our study had limitations. First, although the survey was anonymous, social desirability bias may have led some respondents to give answers that were perceived to be more socially acceptable. Second, we used a hypothetical error vignette with outcomes of variable severity that served as the dependent variables for multivariate analyses; however, answers to hypothetical scenarios may not predict actual behavior. Third, our respondents were based in teaching hospitals and represented internal medicine, family medicine, and pediatrics. Although adjustment for site differences had little effect on our multivariate analyses, our results may not be generalizable to physicians in other specialties or in other practice settings. For example, a recent study³⁸ of pediatricians (439 faculty and 118 residents) found that 92% of participants had used at least 1 formal mechanism to report an

error and that 82% believed they should report near misses to their institutions. Such results contrast with our findings and support the need for further investigation in other populations. Finally, our data were collected in 2004 and 2005 and may not reflect more current attitudes or practices.

The results of this study suggest that physicians' attitudes about the value of error reporting may not be matched by actual behaviors. If correct, the potential causes of this discrepancy ought to be addressed. Health care institutions should continue efforts to create learning environments in which error discussions are valued and those who discuss their own errors are respected. Institutions should also ensure that error-reporting systems are confidential, simple, and worthwhile.^{9,39} To convince physicians that reporting errors is not a fruitless exercise, institutions should advertise examples that display the connection between error analysis and system improvement. Institutions should also teach physicians how to report errors and what errors to report. Without such efforts to facilitate a shift toward a culture of reporting among physicians, the effect of federally protected patient safety reporting systems is likely to be reduced and the reporting bias inherent in these systems will be unlikely to diminish.⁴⁰ Finally, institutions should consider ways to promote patient-centered ethical values that may motivate physicians to report errors in the midst of countervailing pressures,^{19,41} especially in teaching hospitals where role models play a vital part in the formation of trainees' attitudes and practices. Such values are rightly seen as part of medical professionalism⁴²⁻⁴⁴ and reflect a commitment not merely to good systems but to the good of our future patients.

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Correspondence: Lauris C. Kaldjian, MD, PhD, Department of Internal Medicine, I-106 MEB, University of Iowa Roy J. and Lucille A. Carver College of Medicine, 500 Newton Rd, Iowa City, IA 52242 (lauris-kaldjian@uiowa.edu).

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