Medical Error: Using Storytelling and Reflection to Impact Error Response Factors in Family Medicine Residents

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ABSTRACT: I am a healer, yet sometimes I do more harm than good…David Hilfiker, 1984:

OBJECTIVES: Medical error is common and significantly impacts patients, physicians, learners, and public perception of the medical system; however, residents receive little formal training on this topic. Research on error response in practicing physicians is limited, and even more so on medical education interventions to improve this. This study evaluates a curriculum developed to foster the sharing of faculty medical error stories, practice of constructive coping strategies, and growth in resident confidence in managing error.

METHODS: Researchers identified factors related to effective physician error management and recovery to develop a targeted intervention for family medicine residents. The intervention consisted of three one hour didactic sessions in a medium-sized midwestern, urban family medicine residency program over the course of 6 months. Instructional methods included guided reflection after mentor storytelling, small group discussion, role play, and self-reflection.

RESULTS: Of the 30 residents, 22 (73%) completed the preintervention survey, and 15 (50%) completed the postintervention survey. While most residents reported having experienced error (55%), fewer than half of the residents reported they knew what to do when faced with medical errors (46%). This increased to 93% after intervention. Personal error stories from mentors were the most desired type of training reported by residents preintervention, but this was surpassed by legal and malpractice concerns in the postintervention survey. Rates of reported error story sharing increased after the intervention. Residents reported self-efficacy (I can be honest about errors) and self-awareness (I acknowledge when I am at increased risk for error) also increased with intervention. However, these changes did not reach statistical significance.

CONCLUSIONS: Family medicine residents are receptive to learning from peers and mentors about error management and recovery. A brief intervention can impact the culture around disclosure and support. Future research should focus on the impact of targeted interventions on patient-oriented outcomes related to medical error.

KEYWORDS: medical error, curriculum, storytelling, psychological adaptation

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Introduction

Background

The Kohn et al landmark study in 2000 reported preventable medical errors in hospitals resulted in approximately 98,000 deaths across 33.6 million hospital admissions.[1] Recent studies estimate that 440,000 people die in the United States each year due to preventable medical error.[2] Other negative outcomes related to error are myriad: adverse events such as patient harm, disfigurement, complications, increased length of stay, additional tests and procedures, readmissions, rising insurance premiums and health care costs, and the accompanying lack of trust in healthcare providers and institutions among the US public.[3] Other indirect costs that result from medical errors include financial harm from loss of income, disability, and other chronic healthcare challenges, as well as emotional harm such as anger, depression, anxiety, and post-traumatic stress disorder, which can all have a long-term impact.

Even though medical error is the third leading cause of death in the United States, costing between $73.5 and $98 billion in quality-adjusted life years,[1,4] and error experiences are common among residents,[5] residents receive little formal training in error management and recovery.[6] Given the lack of specific training, it is easy to understand how learners may feel ill-equipped to manage errors in clinical practice.

Maladaptive coping strategies to error appear frequently among learners[5,7] and practicing physicians, impacting physicians' quality of life and patient care.[8,9] Researchers have identified common physician trajectories after error,[10] including the commonly reported phenomenon of second victimhood.[11] Fear of litigation, shame, self-blame, and guilt arise from an acute awareness of human fallibility and its impact on patients. These consequences appear cumulative and build across one's career. Further, shame and embarrassment create barriers to disclosure, reducing opportunities for analysis and process improvement.[12] Six stages have been

associated with second victimhood recovery: chaos and accident response, intrusive reflections, restoring personal integrity, enduring the inquisition, obtaining emotional first aid, and moving on, which can involve surviving, thriving, or dropping out of medicine.[10]

Alternatively, speaking up about medical errors is an important act that impacts patient safety, quality of patient care and long-term error reduction as transparency improves.[12] The act of disclosure can be healing for patients and physicians as it provides the opportunity to connect in a meaningful way amid a highly stressful experience, to express care and compassion, and to reinforce patient-centered care as the goal.

Researchers have identified factors associated with desired outcomes when an error occurs: error reporting,[13–16] disclosure,[17] coping,[18,19] constructive change,[19] and growth after error.[20] More specifically, positive forms of coping may include professional counseling, discussing the error with trusted peers, and engaging in quality projects linked to the error. Coping is essential to safeguard the emotional wellbeing of physicians and to prevent burnout. Support and guidance from more experienced physicians positively impact resident emotions and behaviors. Promoting engagement in error disclosure with more experienced physicians helps learners emulate constructive behaviors and identify maladaptive ones.[20]

Previous curricular evaluations have demonstrated the value of simulated clinical scenarios to practice communication-based skills in a safe setting using a team approach.[21–24] Our curriculum contributes to the existing literature by exploring the dimension of storytelling. Storytelling is one such simulation that creates the framework to engage residents in a real clinical scenario, allowing for discussion and practice of disclosure while helping to integrate the challenging concept of personal fallibility into their professional identity.

To summarize, developing an approach to medical error is critical for personal and professional resilience[25] and meaningful participation in quality improvement.[10,26] Curriculum addressing error management and recovery are desired by learners[13,27] and can improve resident knowledge, skills, and abilities in this area.[15,16,28] Mentor storytelling can be particularly effective.[29]

Objectives

Objectives included the development and assessment of a curriculum to improve knowledge, attitudes, and skills needed for constructive response to medical error. We also tried to better understand the impact of the hidden curriculum (unwritten and unofficial lessons residents learn in during graduate training) related to medical error using our presurvey instrument. Specifically, we used detailed questions stemming from (1) "Have you been part of a care team where a patient experienced an error?", (2) "What do you do when you become aware of a medical error?", and (3) "Have you had a mentor (or peer, separate item) share a story about a personal medical error?" Faculty researchers hypothesized that the intervention would result in increases in resident-reported targets (knowledge, skills, and beliefs) and reported medical error talking behavior.

Curriculum development

We developed a curriculum framework based upon the PRECEDE/PROCEED model,[30] traditionally used in planning, implementing, and evaluating behavior change programs. We used the model to identify key predisposing, enabling, and reinforcing factors related to error management and physician growth found in the literature. Our team reviewed the preexisting curriculum and the time and resources available for the study. Based on this, final target factors were selected, including predisposing factors of resident knowledge (awareness of mentor error, steps to effective error disclosure, related professional values, and understanding of local policies and procedures) and resident beliefs (error recovery self-efficacy and attitude toward error). Enabling factors were also selected as targets, specifically resident skills (identify errors and causes, disclose errors, manage emotions/cope, and access support), and a reinforcing factor (talk among colleagues, see Table 1).

The curriculum was organized into 3 resident sessions and a pre/postintervention survey tool for residents and a separate preintervention survey tool for faculty was developed.

Using a backwards design model, we selected curriculum techniques (ie, facilitating reflection and role modeling for affective or attitudinal targets like self-efficacy) for each session objective. We also developed outcome measures based on educational objectives. The listed techniques were used in the sessions carried out with residents (see Table 2).

Methods

Participants

Family Medicine residents (n = 22; out of 30 potential residents) and faculty (n = 7; out of 7 potential faculty) from a medium-sized, urban, midwestern program participated. Participants were recruited by email and from weekly didactics. Didactics are a required component of residency training; however, residents on inpatient service, postcall, vacation, away rotation, or those who are ill may not be in attendance.

Inclusion criteria included residents in attendance during sessions. Also, the program faculty roster was used to invite faculty participation. The following were excluded from the study: learners who were not Family Medicine faculty or residents (ie, medical students). The Family Medicine residency program agreed to participate in the project as a pilot study though individual participation was voluntary.

Electronic written consent was obtained from participants. On August 26, 2022, the Institutional Review Board at Wright State University, the ACGME sponsoring institution,

Table 1. Factors identified through literature review related to physician error management and growth after error (bold items were selected as targets; adapted from Langlois and Hallam[30]).

PREDISPOSING	ENABLING	REINFORCING
Training[13,31–33]	**Skill—identify errors and causes**[20]	Reminders—routine error processing/daily activities[15]
Know what error is[34]	**Skill—disclose errors**[17,20,28,31,32,35–39]	Reminders—routine peer and mentor support[20]
Know steps to effective disclosure[20]	**Skill—manage emotions**[18,20,40]	Positive reinforcement—the quality of disclosure[11,41]
Know factors associated with physician recovery[10,40,42]	**Skill—cope**[7,13,18,26,35,43]	**Positive reinforcement—"talking" to process**[20,25,40]
Know related professional values[44,45]	**Skill—access support**[20]	Positive reinforcement—feedback regarding process improvement after error reporting[20]
Know local policies and procedures[13,44]	Access—support for reporting, disclosing from peers and supervisors[15]	Support—family, friends, colleagues, mentors, mental health, supervisor, patient safety organizations, religious community[18,19,40]
Believe error is a common experience[20]	Access—nonpunitive environment[39,44]	
Believe doctors should disclose[46]	Access—role models[13]	
Believe it is safe and effective to disclose[19]	Access—routine error debriefing/daily activities[15]	
Believe I can recover/grow after error[33]	Access—easy reporting[14,16,44]	
Intend to grow from errors[20]	Access—mental health support[7]	
	Access—colleague and mentor support for recovery and growth[18,40]	

found this research proposal (Study 7293) to protect the rights and welfare of human subjects and to meet the requirements of Wright State's Federal Wide Assurance (FWA 00002427) and the federal regulations for the protection of human subjects in research (eg, 2018 45 CFR 46.104).

Pre-existing curriculum

The Family Medicine residency program, which served as a pilot, provides an online patient safety curriculum completed during resident orientation. The program has a longitudinal wellness curriculum that involves the development of a personalized wellness plan (updated each year) and provides a wellness session specific to medical error (second year) as well as a dedicated didactic session on disclosure training (given once every 3 years). In addition, morbidity and mortality talks are given by the chief of service each month, which provides an opportunity to discuss medical errors. Local rotation sites have policies related to medical error and disclosure.

Presession

Residency faculty were approached for willingness to share a story of a personal medical error and its aftermath. Once a faculty presenter was identified, they were given guidance on the story's length and overall objectives. Preintervention survey was sent to residents to complete prior to session 1.

Sessions

During session 1, the faculty presenter shared their story with the residents. After the story was shared, the facilitator guided residents in reflection using the following prompts: Why did this happen? What did the physician feel/do? What would you do? Did the physician recover; how? Did the patient recover? Did anyone learn from the mistake? What surprised you? In addition, the facilitator presented a small amount of lecture material, facilitated small and large group discussions, and prompted timed self-reflection through writing. Session 2 used a discussion of key related professional values to stimulate interest in the topic of error and a sense of related culture norms as well as open discussion of related fears and barriers to impact confidence in error disclosure. The faculty presenter introduced safety culture, and residents had the opportunity to reflect on the strengths and weaknesses of the current practice culture. In session 3, the faculty presenter reviewed local institutional policies and procedures related to medical error. The residents practiced self-awareness, error disclosure, root cause analysis, and coping skills.

Table 2. Session objectives and methods.

SESSION	OBJECTIVES	METHODS	OUTCOME MEASURE(S)
Session 1 (personal stories)	Understand that error is a common experience to all physicians	Mentor storytelling Guided reflection Large group discussion	My mentors have made errors in their care for patients
	Describe common causes of error	Lecture Large group discussion	
	Identify ways that physicians cope and thrive after error	Mentor storytelling Guided reflection Lecture Large group discussion	
	Develop a strategy for acknowledging and processing medical error	Guided reflection Lecture Large group discussion	What do you do when you become aware of a medical error?
Session 2 (ethics and culture)	Apply professional values to the topic of medical error	Lecture Small and large group discussion Self-reflection	Good doctors should be honest about errors
	Openly discuss fears related to medical error	Polling Small and large group discussion	
	Describe safety culture and identify ways that colleagues can help with error management and recovery	Lecture Small and large group discussion	
Session 3 (local policies and practice)	Describe local policies and practices related to medical error	Small and large group discussion Polling	• I know what to do when faced with errors at my institution • What do you do when you become aware of a medical error?
	Practice self-awareness, error disclosure, and root cause analysis	Self-reflection (writing) Polling Roleplay Small and large group discussion	• I acknowledge when I am at increased risk for error • I can be honest about errors
	Practice coping skills	Self-reflection (writing/ letter to future self)	I can recover after a medical error

Each session was presented during resident didactic time and lasted one hour. Sessions were presented over 6 months: the first in August 2022, the second in November 2022, and the final in January 2023.

Survey tool and collection

Researchers developed a survey to assess resident knowledge, experience, beliefs, values, and behaviors in the context of medical error (see Supplementary Data for Survey). Survey tool responses included free text, Yes/No/Don't know, and Likert scale (see Supplementary Data for Survey tools). The resident preintervention survey invitation was sent out prior to session 1 in August, and this survey closed at the start of session 3 (to capture responses from residents not present for previous sessions). The postintervention survey invitation was sent out after our final session and closed on February 10, 2023. Survey responses, including consent, were collected electronically using REDCap (Research Electronic Data Capture), a software toolset and workflow methodology for the electronic collection and management of research data. Anonymous responses were analyzed and compared.

Statistical analysis

We used count data as well as Wilcoxon signed-rank tests for numeric variables and McNemar's test for binary variables to compare presurvey and postsurvey responses. Sample size/power analysis was not calculated for this study. The data analysis for this article was generated using Excel and SAS software©. The reporting of this study conforms to the STROBE Cohort guidelines statement[47] (see Supplemental File for checklist).

Results

Response rate

Twenty-two (73%) residents completed the preintervention survey, and 15 (50%) completed the postintervention survey.

Seven residents completed presurvey and postsurveys that were able to be matched. Of the 15 residents who completed a post-intervention survey, 1 attended only 1 of the sessions, 5 attended 2, and 9 attended all 3. Additionally, 7 out of 7 faculty completed a preintervention faculty survey.

Results by count

Preintervention responses demonstrated strengths and opportunities for improvement in the pre-existing curriculum. Most residents reported having experienced errors (55%, n = 12 out of 22) and having had a mentor or peer share an error story with them (73%, n = 16 out of 22). Among those with an error experience (n = 12 out of 22 respondents), 10 (83%) reported the error was disclosed to the patient. Many residents with error experience reported that their team or organization learned from the error (75%, n = 9 out of 12), and error acknowledgement and debriefing by the team were common (92%, n = 11 out of 12 and 83%, n = 10 out of 12, respectively). When compared with residents, a higher percentage of faculty reported confidence with error disclosure (I can be honest about errors that I make as a doctor, 100%, n = 7 out of 7, faculty vs 83%, n = 19 out of 22, resident respondents). A higher percentage of faculty also reported confidence with personal recovery (I can recover after a medical error, 100%, n = 7 out of 7 faculty vs 78%, n = 18 out of 22 residents) and relationship recovery (patient-physician relationships can recover after a medical error, 100%, n = 7 out of 7 faculty vs 87%, n = 20 out of 22 residents).

Postintervention survey responses demonstrated an increase in several reported target factors: knowledge of local procedures, disclosure confidence, accessing support as an error response, faculty and peer story sharing and acknowledgement that mentors have made errors. Specifically, reported knowledge of local procedures (I know what to do at my institution when faced with a medical error) increased from 46% (n = 10 out of 22) to 93% (n = 14 out of 15; see Figure 1).

While all participants (residents and faculty) reported good doctors should disclose error, disclosure self-efficacy among residents (I can be honest about errors) increased after intervention from 86% (n = 19 out of 22) to 93% (n = 14 out of 15 (Figure 2).

Resident self-awareness (I acknowledge when I am at increased risk for error) increased after intervention from 77% (n = 17 out of 22) to 93% (n = 14 out of 15).

Postintervention survey responses also showed an increase in residents reporting reaching out to others as an error response, from 36% (n = 8 out of 22) to 87% (n = 13 out of 15). After intervention, rates of reported faculty and peer story sharing increased, and resident-reported awareness that mentors have experienced error increased from 68% (n = 15 out of 22) to 87% (n = 13 out of 15) (Figure 3). Incidentally, all faculty respondents reported "I have made errors in my care for patients".

Debriefing with the team remained common, but the rate of residents reporting "feeling bad about myself" as an error response increased from 41% (n = 9 out of 22) to 60% (n = 9 out of 15). Six residents out of 15 (40%) reported an emotionally difficult rating of 5 or greater for the curriculum. Overall, residents reported the training was helpful (Figure 4).

Before the intervention, residents were most interested in further training through personal stories of mentor error (73%, n = 16 out of 22), and after the intervention, residents reported the most interest in additional training in legal and malpractice risk (73%, n = 11 out of 15).

Tests for statistical significance

While postintervention responses showed increased rates for several target beliefs and reported knowledge, results did not reach statistical significance (Table 3).

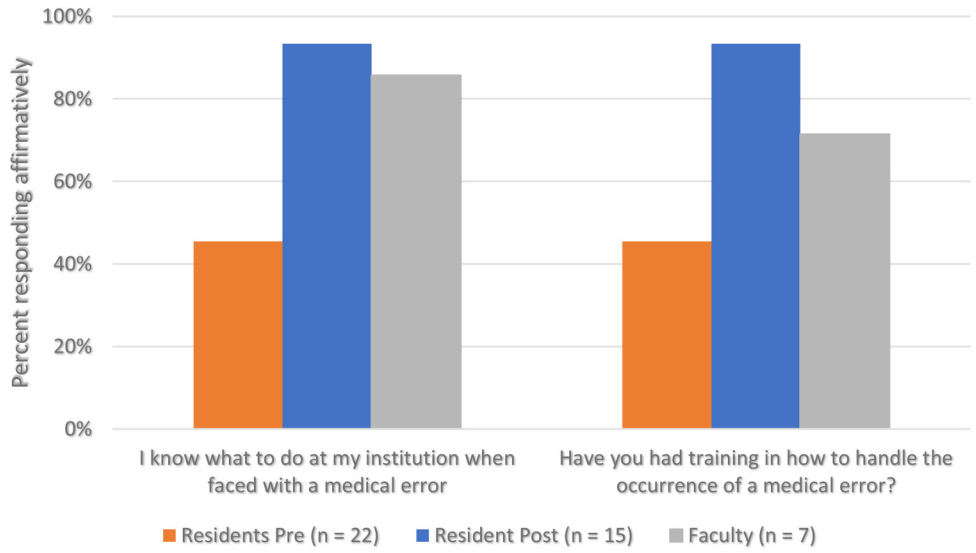

Figure 1. Error and training among faculty and residents.

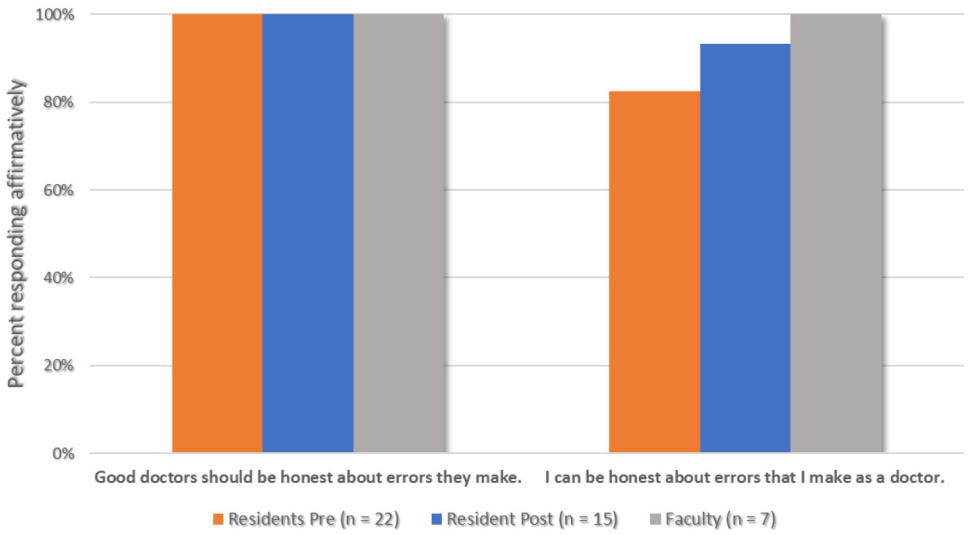

Figure 2. Faculty and resident beliefs about error.

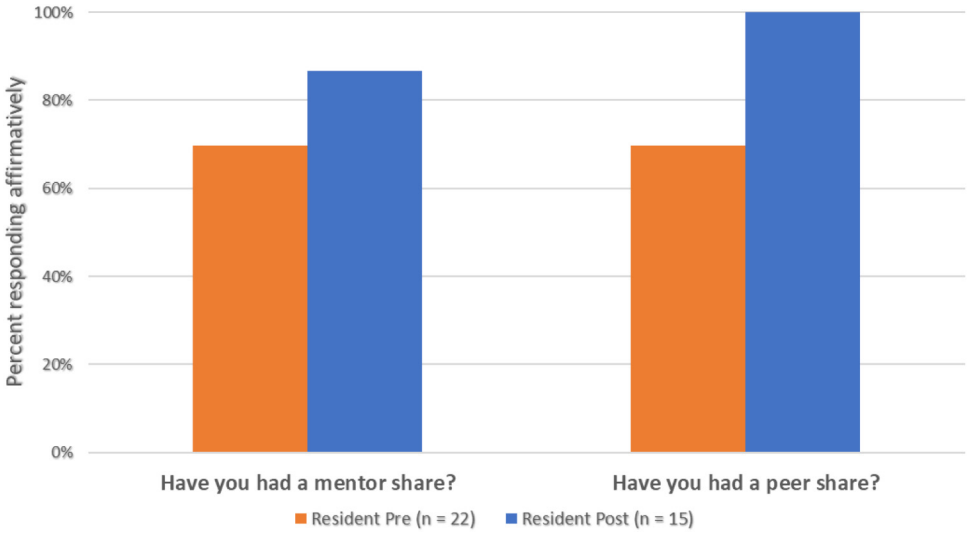

Figure 3. Resident experiences with error stories.

Qualitative results

Free text responses describing resident approaches to processing error included "tried not to let the same error recur" and "stages of grief." Residents also commented on the importance of patient harm (or lack thereof) for their response: "Dose was non-lethal and had no adverse effect, so not much was made of it. It could have been a huge deal." One resident out of 22 described the process for disclosing to the patient: "privately with attending," while others commented "not sure above me" or answered "don't know."

Discussion

Most residents reported having had experience with team or personal error, confirming the importance of medical error education and training. All residents (preintervention and postintervention) and faculty reported that good doctors should be honest about their errors, suggesting this belief may be a less important target for intervention. The literature has shown a disconnect between this belief, intent to disclose, and actual disclosure rates.[46] In a 2023 study of healthcare educators, Wawerski et al found that individual personalities, beliefs and perceptions of the organizational or team culture, as well as moral courage, impact decisions that healthcare workers make in terms of disclosing medical error.[48] Therefore, beyond resident attitudes and beliefs, resident and patient-oriented outcomes are an important next step in curriculum assessment (eg, resident milestones data, error reporting rates at primary rotation sites, institutional patient safety survey information, and objective assessment of resident skill with disclosure).

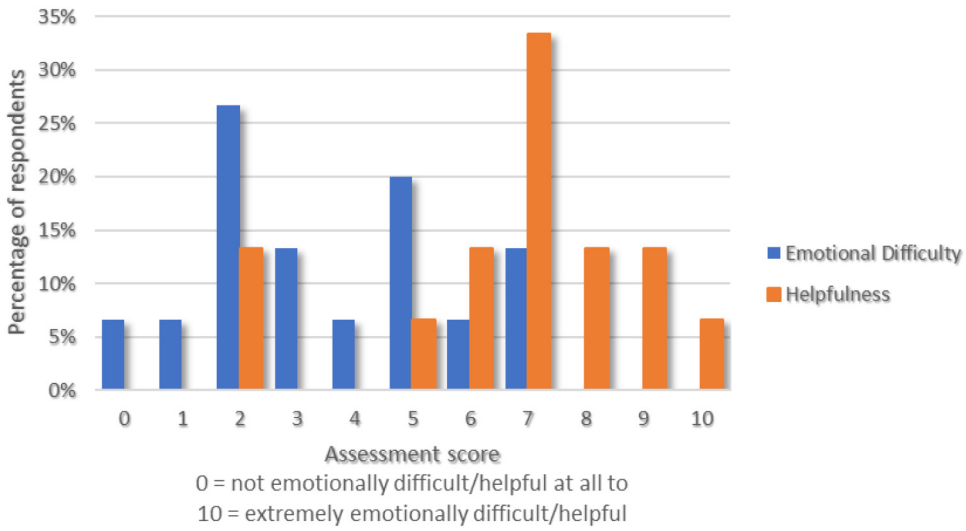

Figure 4. Resident assessment of curriculum.

To provide patient-centered care, disclosing medical errors to patients and families should be timely, explicit, and empathetic.[32] Our study did not directly evaluate knowledge and skills of effective disclosure (instead using resident reports of knowledge and confidence), but this is a key area for future work. Barriers to fully disclosing an error include the culture of perfection in medicine, the psychological impact of facing mistakes and apologizing for them, ethical complexities (level of harm done), lack of formal training on disclosing medical error, and fear of malpractice litigation.[32,49]

In our study, residents requested further training in legal and malpractice concerns (postintervention). This shift in interest could indicate a deficiency in the curriculum, or a natural, next-step shift, but certainly highlights the importance of this topic for residents and a potential source of curriculum development in the future.

We hypothesized that residents would report higher self-efficacy on the postintervention questionnaire. While rates increased, we could not confirm this increase with statistical certainty. Surprisingly, the rate of residents who report feeling bad about themselves after an error also increased. Perhaps the act of addressing this subject as a group was emotionally charging. In their study of a longitudinal curricular intervention, Fox et al[15] found that the incorporation of frequent reporting and discussion of medical errors improves patient care and improves the safety and comfort of residents during their training process. Incorporating regular and routine error reporting and discussion may help better support residents during future curriculum iterations but will require faculty development and minor changes in basic practices like rounding.

Residents who recognize that they made a medical error experience a profound emotional response, leading to engagement in various coping strategies.[7] Emotional responses from residents can occur during involvement in harmful interactions, patient injury, and unexpected negative events, leading to self-blame.[50] This underscores the importance of including resident support resources during the sessions themselves, as well as ongoing venues for support and "talk" surrounding medical error. Few studies have explored what coping mechanisms medical residents use after a self-perceived medical error, which could prove to be a meaningful focus for future research.

Limitations of our study centered on the desire to develop a comprehensive curriculum and a limited sample size. Sample size/power analysis was not calculated for this study, limiting generalizability. The questionnaires used were not previously validated; however key targets were selected from the literature to develop questionnaire items, and face validity was considered. This study does not allow specific curricular components to be associated with changes in resident responses. Similarly, the complexity of error response and the scope and time for our study limited our ability to associate our curriculum with specific changes in rates of error reporting, disclosure, access to formal support, objective knowledge and skill measures, or patient-oriented outcomes like satisfaction with error disclosure or care relationship after error. The study's time frame allowed only for short-term reassessment of survey responses, which could differ from long-term impacts.

We plan to refine the curriculum based on outcomes from this project and consider outreach to residencies in other specialties for interdisciplinary didactics. Residents will benefit from an increase in the variety of actual cases to process together, and this curriculum will take time to strengthen behavioral norms around error. The medical community will benefit from further refining the model for error management and growth behaviors among residents.

Further work should also focus on the integration of curriculum into daily practice, which appears critical to fostering a growth response among physicians and better outcomes for patients. This can involve simple changes to patient rounds, like adding the question "were there any patient safety concerns overnight?".[15] In addition, using every error as an opportunity

Table 3. Resident responses among those with pre and post (N = 7).

VARIABLE	PRESURVEY[a]	POSTSURVEY[a]	*P**
Good doctors should be honest about errors they make			.35
Strongly agree	3 (42.9%)	5 (71.4%)	
Agree	4 (57.1%)	2 (28.6%)	
If I am smart enough, I can avoid medical error for myself and my patients			.99
Strongly agree	0 (0.0%)	1 (14.3%)	
Agree	1 (14.3%)	1 (14.3%)	
Disagree	5 (71.4%)	5 (71.4%)	
Strongly disagree	1 (14.3%)	0 (0.0%)	
My mentors have made errors in their care for patients			.35
Yes	4 (57.1%)	6 (85.7%)	
Not sure	3 (42.9%)	1 (14.3%)	
Patient-physician relationships can recover after medical error			.99
Strongly agree	1 (14.3%)	1 (14.3%)	
Agree	5 (71.4%)	5 (71.4%)	
Neutral	1 (14.3%)	1 (14.3%)	
Physicians can recover after medical error			.77
Strongly agree	2 (28.6%)	3 (42.9%)	
Agree	4 (57.1%)	3 (42.9%)	
Neutral	1 (14.3%)	1 (14.3%)	
I can recover after a medical error			.35
Strongly agree	2 (28.6%)	1 (14.3%)	
Agree	3 (42.9%)	4 (57.1%)	
Neutral	2 (28.6%)	1 (14.3%)	
Disagree	0 (0.0%)	1 (14.3%)	
I can be honest about errors that I make as a doctor			.99
Strongly agree	1 (14.3%)	1 (14.3%)	
Agree	5 (71.4%)	6 (85.7%)	
Neutral	1 (14.3%)	0 (0.0%)	
Have you had a mentor share a story about a personal medical error?			.32
Yes	5 (71.4%)	6 (85.7%)	
No	2 (28.6%)	1 (14.3%)	

n (%).
*Tests include Wilcoxon signed-rank tests for numeric variables and McNemar's test for binary variables.

to role model effective error management and recovery and to engage residents in this process will require faculty development in this area.[51] Efforts may be catalyzed by elevating error management and recovery as a seventh core competency for graduate medical education[52] and a re-emphasis on professional formation at all levels of medical education.[53]

Conclusions

Our intervention was associated with a trend toward increased rates of self-reported resident knowledge, disclosure self-efficacy, and story sharing related to medical error, although increases did not meet statistical significance. This resident sample found our curriculum to be helpful and feasible.

Future study will include larger sample sizes. Future assessment of these curricular components should move from short-term, self-reported resident knowledge and beliefs to long-term resident and patient-oriented outcomes, such as error reporting rate, disclosure skills assessment by both faculty and patient, and overall error rates.

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Consent

Electronic written consent was obtained from participants.

Disclaimer

Wright State University had no role in the design, data collection, analysis, or writing of this paper.

Ethical approval

On August 26, 2022, the Institutional Review Board at Wright State University, the ACGME sponsoring institution, found this research proposal (Study 7293) to protect the rights and welfare of human subjects and to meet the requirements of Wright State's Federal Wide Assurance (FWA 00002427) and the federal regulations for the protection of human subjects in research (eg, 2018 45 CFR 46.104).

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Supplemental Material

Supplemental material for this paper is available online.

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