Radiology

Error Disclosure and Apology in Radiology: The Case for Further Dialogue

Stephen D. Brown, MD • Michael A. Bruno, MD, MS • Jeffrey Y. Shyu, MD, MA, MPH • Ronald Eisenberg, MD, JD • Hani Abujudeh, MD, MBA • Alexander Norbash, MD, MS • Thomas H. Gallagher, MD

From the Department of Radiology and Institute for Professionalism and Ethical Practice, Boston Children's Hospital and Harvard Medical School, 300 Longwood Ave, Boston, MA 02115 (S.D.B.); Department of Radiology, Penn State Milton S. Hershey Medical Center, Hershey, Pa (M.A.B.); Department of Radiology, Brigham and Women's Hospital, Harvard Medical School, Boston, Mass (J.Y.S.); Department of Radiology, Beth Israel Deaconess Medical Center, Harvard Medical School, Boston, Mass (R.E.); Department of Radiology, Detroit Medical Center, Detroit, Mich (H.A.); Department of Radiology, Envision Physician Services, Plantation, Fla (H.A.); Department of Radiology, University of California, San Diego, San Diego, Calif (A.N.); Department of Medicine and Department of Bioethics and Humanities, University of Washington, Seattle, Wash (T.H.G.). Received January 18, 2019; revision requested January 20; revision received April 15; accepted April 30. **Address correspondence to** S.D.B. (e-mail: *Stephen.brown@childrens.harvard.edu*).

Conflicts of interest are listed at the end of this article.

Radiology 2019; 293:30–35 • https://doi.org/10.1148/radiol.2019190126 • Content code: PR •

Momentum has grown around turning the principle of being transparent with patients about harmful errors into practice (1–7). More than 200 U.S. institutions have implemented communication and resolution programs (CRPs), with the support of major liability insurers, the Institute of Medicine, and the Agency for Healthcare Research and Quality (2). While several papers have introduced the subject to radiologists (8–13), there is an absence of dialogue regarding how to prepare radiologists to manage disclosures and apologies effectively, and important issues specific to radiology remain unclarified.

In this article, we describe recent developments driving widespread disclosure and apology efforts in the United States, and we encourage radiologists to prepare to discuss errors directly with patients. Unfortunately, most radiologists remain profoundly uncomfortable with the prospect of talking with patients about errors; several barriers impede progress toward a radiology workforce prepared for this challenge. Radiology still lacks consensus around issues specific to radiologic practice and educational opportunities to facilitate effective error disclosure. Even as error disclosure practices are ultimately the domain of individual health care institutions, greater clarification around key unanswered questions specific to radiologic practice would support adapting disclosure strategies to this practice environment. Movement toward consensus around error disclosure practices, similarly to those used for templated reporting, critical results communication, and incidental findings, would minimize variability, where desirable, and ultimately counteract important barriers to optimal practice. At the least, accelerating the dialogue among relevant stakeholders, as is currently occurring around the codes of ethics and practice for artificial intelligence (14), will illuminate the path forward around this timely and important subject.

Developments in Professional, Cultural, and Institutional Norms

Patient Safety and Transparency

Expectations related to error disclosure and apology have evolved since the Institute of Medicine documented unexpectedly high mortality rates from preventable adverse events in the U.S. health care system (1,15,16). Bioethics and patient safety leaders have long considered disclosure and apology as ethically imperative and essential to health care safety (7,13,17–19). Major leaders in the patient safety movement, such as Lucian Leape, Donald Berwick, and others, have long emphasized that "in complex, tightly coupled systems like health care, transparency is a precondition to safety. Its absence inhibits learning from mistakes, distorts collegiality and erodes patient trust" (18). Directly connecting error disclosure and apology with safer higher quality care remains empirically difficult, although early experience in systems housing robust disclosure and apology processes suggests the promise of meaningful institutional quality and safety enhancements (see the Risk Management Innovations and CRPs section later in this article) (2,5,7,20).

Radiology itself has taken important steps toward greater accountability concerning errors through organized quality improvement mechanisms designed to review radiologists' performance and identify clinically harmful errors (21,22). This trend of addressing error accountability synchronizes effectively with broader initiatives promoted by safety and quality experts. As errors are being increasingly recognized, shared, and categorized, this will naturally present opportunities for providers to potentially discuss these events with patients (21,22). The maturation of systematic peer review approaches to quality improvement, such as the American College of Radiology's RADPEER, has led RADPEER committee members to opine that direct discussions with patients may often be appropriate when errors are identified through RADPEER (21). A major opportunity would be lost if potential transparency were undermined by an inability to effectively couple error disclosure with increasingly robust peer review processes. Some may argue that quality improvement systems like RADPEER can function effectively regardless of whether detected errors are disclosed to patients. The RADPEER program and the many variations used in radiology departments undoubtedly help radiologists identify problem areas, many of which can be rectified by that recognition. Evidence from one large multi-institutional health system has suggested, however, that the likelihood of discussing errors with patients may

Abbreviation

CRP = communication and resolution program

Summary

Radiology's leaders in peer review, patient-centered care, quality and safety, legal affairs, and institutional processes can help prepare radiologists to communicate openly with patients and families about errors by spearheading dialog within the profession regarding how best to implement this emerging practice standard.

Essentials

- Over 200 hospitals in the United States have implemented risk management–endorsed institutional mechanisms for open and honest communication with patients about errors in response to legislative momentum, tort system concerns, patient safety interests, and persuasive ethical claims.
- Available evidence suggests well-coordinated disclosure and apology processes can promote meaningful institutional quality and safety enhancements without increasing liability risks.
- Further dialogue within the radiology community about error disclosure practices is a natural and logical extension of discourse that has burgeoned in radiology around patient-centeredness and quality and safety.

be associated with the likelihood of reporting and discussing errors internally (23).

Professional Societal Norms

Expectations for disclosing errors to patients are present in multiple professional codes. The Physician Charter on Medical Professionalism, which explicitly mandates patients be informed when injuries occur due to medical errors, has been adopted by the American College of Radiology, American Board of Radiology, and Radiological Society of North America (24,25). The Radiological Society of North America bylaws directly incorporate the American Medical Association Code of Ethics, which articulates an ethical obligation by physicians to inform patients of consequential errors (24,26).

Some leading professional organizations outside of radiology have not only enshrined these standards within adopted ethical codes, but also articulated disclosure expectations directly to their constituents. The American College of Obstetricians and Gynecologists (ACOG) Committee on Patient Safety and Quality Improvement frames error disclosure as "critical" both for sustaining high-quality care and for maintaining healthy patient-physician relationships (27). The American College of Physicians (ACP) ethics manual states, "physicians should disclose to patients information about procedural or judgment errors made in the course of care if such information is material to the patient's well-being" (28). The ACP notes that "errors themselves do not necessarily constitute improper, negligent or unethical behavior, but failure to disclose them may." The ACOG and ACP declarations endorse explicit and unambiguous cultural norms and frame them as matters of ethical, quality, and safety imperatives. To date, no such directives have been issued within radiology.

Patient-centered Care

Error disclosure is fundamental to patient-centered care. Over the past two decades, a cultural evolution toward patient-centeredness and shared decision making has resulted from increased emphasis on individual autonomy and consequential acknowledgment of patient preference–driven decision making as an expectation (29–32). Patient-centeredness is key among the Institute of Medicine's core dimensions of high-quality health care, and it expressly includes a patient's ability to make well-informed decisions after an error has occurred. Patient-centered care has been strongly avowed by radiology leaders (25,33,34), although error disclosure has not been explicitly or openly endorsed at the professional societal level in a manner such as that expressed by the ACOG or ACP. This misalignment represents a gap in radiology's approach to patient-centeredness, given strong evidence that patients expect to be informed when errors occur (6,35,36) and supportive evidence that event disclosure may be associated with enhanced patient perceptions of quality (27).

Legal Climate

Momentum to establish error disclosure as a practice standard in the United States relates, in part, to broad consensus that the current U.S. tort system is deeply flawed (4,7,13,37–40). Specifically, the entrenched deny-and-defend approach to medical liability precludes open physician-patient communication, stifles transparency within institutions, and needlessly compounds potential harm to patients. We have learned that patients are more likely to sue if they believe they have been dealt with dishonestly or opaquely after adverse events (35). This adversarial environment creates a focus on individual culpability rather than mutual empowerment and system improvement.

Legislative Changes

Legislative momentum in the United States has escalated toward protecting apologies and mandating disclosure (7,13). Three-quarters of states now have laws to encourage error disclosure by making apology statements inadmissible in court (40). Massachusetts, for example, protects acknowledgments of sympathy and responsibility, unless material facts contradict the disclosure content (40,41). Most of these laws protect only expressions of regret (ie, saying "I'm sorry") rather than broader disclosures, but at least 11 states now have laws mandating patient notification regarding unanticipated outcomes. Massachusetts requires institutions to inform patients fully "in situations where a patient suffers an unanticipated outcome with a significant medical complication resulting from the provider's mistake" (41). As in Massachusetts, such laws typically place disclosure burden on institutions rather than on individual providers. Although commendable, the variable character of these apology and disclosure laws creates uneven and sometimes weak protections (4,40,42). One manifestation of this statutory inconsistency has been that apology laws may protect statements of sympathy but permit admissibility of statements of responsibility, which might unintentionally discourage open disclosure and apology (42). Nonetheless, these laws represent an important signal of support from lawmakers.

Risk Management Innovations and CRPs

Numerous major U.S. health care enterprises have implemented error disclosure and apology initiatives in response to legislative momentum, tort system concerns, patient safety interests, and persuasive ethical claims (4,5,7,37–39,43,44). The national proliferation of CRPs is particularly notable (2,7). These health system programs promote transparent communication with patients and families about unanticipated adverse outcomes, and they encourage proactive explanations, apologies, and—when appropriate—compensation offers. Most CRPs recognize that patients expect explanations and apologies and that they may be entitled to financial compensation. They explicitly acknowledge that expedient responses to patients' expectations are in the best interests of patients and institutions, although they understand their charge to defend providers rigorously when care has been proven reasonable (7). CRPs also recognize that optimal outcomes require a multitiered comprehensive institutional commitment. Notably, the emphasis for CRP adoption has shifted away from financial benefits and toward beneficial implications for patient safety, even among traditional risk managers and liability insurers (2,45).

CRPs also promote changes in how institutional cultures react to errors internally. They emphasize that most preventable adverse events arise from an unfortunate confluence of the actions of multiple agents, systems, and processes. Accordingly, CRPs encourage a Just Culture philosophy, by which well-intentioned employees are not blamed or punished for actions consistent with their training and experience (2). Such cultures acknowledge personal and systemic accountability for suboptimal performance and use sophisticated understanding of missed opportunities to improve performance through nonpunitive educational interventions and coaching (46,47). A related cultural priority has emerged to incorporate error disclosure processes into overall organizational strategies to address physician well-being, wherein well-designed services for supporting clinicians involved in errors are considered crucial to the overall disclosure program (2,27). Such "care for the caregiver" mechanisms may incorporate multiple layers of support, including local departments and units, institutional resources, and external referral networks of psychosocial professionals, such as chaplains, psychologists, and social workers (48). Even the existence of these cultural norms and programs may enhance clinician well-being broadly by promoting confidence that systems will treat personnel with compassion and respect under adverse circumstances.

The University of Michigan houses perhaps the best-recognized CRP. It initiated a disclosure, apology, and compensation program in 2001. Over 10 years, the hospital system experienced 40% fewer claims, lowered liability costs, and shortened resolution times when compared with those at baseline (44). Stanford University implemented its CRP in 2007 and reported an absolute savings of $3.2 million after its implementation (40,43). The University of Illinois Medical Center at Chicago experienced a substantial increase in the number of reported events after CRP implementation, without a corresponding increase in the number of lawsuits or payouts (49). Over 150 system improvements resulted from their CRP during its 2-year reporting period. The Controlled Risk Insurance Company of Vermont (CRICO) insures the Harvard-affiliated medical institutions, including Boston Children's Hospital, Massachusetts General Hospital, Brigham and Women's Hospital, and Beth Israel Deaconess Medical Center. CRICO reports that it has "resolved every claim presented after disclosure and apology without protracted litigation," although it acknowledges that it does "sometimes have to pay a premium on the fair indemnity amount to do so" (50). CRICO strongly endorses transparent disclosure and apology processes "not simply to avoid lawsuits, but because it is the right thing to do" (50). Most recently, Beth Israel Deaconess Medical Center and Baystate Medical Center, two major Massachusetts hospital systems that subscribe to the same CRP (the Massachusetts Alliance for Communication and Resolution following Medical Injury, or MACRMI), reported their early experience that litigation and costs did not increase after program initiation (5). About 40% of reviewed cases yielded safety improvement actions. These included sharing of investigations with clinical staff, establishment of educational initiatives, policy changes, safety alerts, and quality improvement systems measures.

Those entities reporting benefits from error disclosure and apology initiatives have been predominantly academic institutions with captive insurance mechanisms. There is little published data to support whether formalized error disclosure and compensation processes decrease malpractice litigation outside such systems. Some private insurers have nonetheless moved decidedly toward CRP models. BETA Healthcare Group, the largest liability insurer on the West Coast, now provides premium discounts to its privately insured member systems that implement CRP interventions (2,51).

Barriers and Unanswered Questions

Numerous barriers prevent broad establishment of robust error disclosure practices (6,8,16,45). Individual provider reticence may reflect inadequate institutional support, insufficient training opportunities, and pervasive fear of malpractice, financial repercussions, or loss of professional standing. Although some radiologists harbor historically deep-seated fears of litigation (12), institutional reticence may preclude disclosure, even in circumstances in which radiologists might be amenable. Further, many states, insurers, and provider systems steadfastly adhere to the existing tort-based paradigm, despite the Institute of Medicine's assertion that CRPs are a pragmatic alternative (45). CRP cases involving multiple insurers are particularly difficult to resolve (3,40). Some fear that open disclosure policies will unleash a flood of litigation because patients are currently aware of relatively few actual serious preventable events, although published experiences have not substantiated this concern (4,5,7,52).

Other challenges affect radiologists more uniquely. These include radiologists' historical lack of relationships with patients (except for notable subsets, such as mammographers and interventional radiologists), a lack of compensated structured time and space for communication with patients, the permanence and accessibility of radiographic images providing an enduring liability focus, and the natural subjectivity inherent to diagnostic imaging (8,13,53). Radiologists practice in an environment

of high uncertainty, with a substantial range of acceptable variability in radiologic interpretation. Radiology experts frequently disagree even with their own prior interpretations (54). Radiographic image interpretation is subject to considerable outcome and hindsight bias, which may complicate determination of reasonable thresholds for disclosure, apologies, and compensation. Consequently, determination of whether a radiologic interpretive error has occurred is increasingly a matter of retrospective peer or expert consensus rather than a matter of one expert's opinion. Further, radiologic errors are not monolithic. Some result in immediately recognized and temporally proximate consequences, while others may not be apparent for an extended period. Radiologic errors may ultimately result from a variable and complex interplay of image misinterpretation, procedural mishaps, systems processes, and communication lapses.

These barriers stand alongside key unanswered questions regarding how best to implement disclosure and apology practices within the scope of radiologic practice. For example, how do we accommodate the myriad unique circumstances and consequences sometimes associated with radiologic errors? Many radiology errors represent delayed diagnoses whose impact on given outcomes may be difficult to assess. The design of disclosure and apology responses specifically for radiology will require flexibility that distinguishes among technical and procedural errors, missed findings, reasonable but ultimately incorrect interpretations leading to delayed diagnoses, and interpretive errors that most radiologists working in similar circumstances would not have made (55–62). It will be important to distinguish among these to help radiologists and their institutions elucidate thresholds for when disclosures should be made, when direct apologies might be appropriate (versus expressed sympathy for adverse outcomes), and when compensation offers should be considered (60).

Questions also remain around how best to manage the reporting and retrospective characterization of "missed findings" and interpretative errors and whether they were prospectively reasonable. Challenges persist over whether to report or disclose "near misses" or errors that have minimal clinical consequences, either because other health team members have interceded before harm was done, or, perhaps, because of sheer luck. This is uncharted territory. Most would argue that the strongest ethical arguments are for disclosure of harm-causing errors. Some may fear that communicating with patients about near misses may create undue distress and that the need to do so may overwhelm or discourage efforts to enter the events into rigorous peer review. Others would maintain, however, that nondisclosure may breach physicians' basic fiduciary and ethical responsibilities to patients (63). Considerable debate also lingers around reporting and disclosing errors that are made by other parties, such as referring physicians who do not act on imaging findings or recommendations that are reported and reasonably communicated or radiologists from outside institutions who have rendered erroneous interpretations (64). Other unresolved questions exist around how best to notify patients about retrospectively identified clinically important findings after a long delay and whether and how best to bring currently and previously reporting radiologists into dialogue with the patient and his or her family. Numerous publications suggest that many patients desire direct consultation with the radiologists who interpret their imaging studies (although some do not), and consultation services have been established to facilitate such communication. Similar patient preferences and institutional practices around radiologic errors are unknown.

Addressing Barriers and Key Unanswered Questions for Radiology

In the past, even where strong professional expectations for error disclosure and apology systems were established (eg, American Medical Association, American College of Physicians, American College of Obstetricians and Gynecologists), these norms were rarely translated into detailed process-oriented recommendations and educational resources. This represented a critical gap in preparing physicians for error disclosure. Fortunately, more comprehensive guidelines and roadmaps for error disclosure processes have recently emerged, facilitated by educational and program development consultative materials now provided by the Agency for Healthcare Research and Quality's Communication and Optimal Resolution (CANDOR) program and toolkit (65), and the Collaborative for Accountability and Improvement (CAI), a support, advisory, and policy-making initiative established by the movement's early leaders and key to the successful dissemination of CRPs nationally (66). These consensus-driven resources have introduced solutions to the imposing barriers to disclosure experienced by institutions and individual clinicians, and they have made the realization of ideal communication with patients and families about harmful errors and adverse events practicable in a way not necessarily apparent even 5 years ago. The offered solutions remain generalized, however; a few tools have been adapted to address the unique challenges of individual specialties. Practical published guidance is limited regarding barriers and questions specific to radiologic practice.

Institutional executives, legal consultants, quality and safety officers, and risk managers seem likely to turn to radiology department leaders for guidance in formulating policies to address persistent radiology-specific barriers and unanswered questions as institutional disclosure and apology mechanisms proliferate nationally. This is similar to how radiology departments are often expected to create tailored radiology-specific solutions for institutional priorities around patient-centeredness and quality and safety. Indeed, further dialogue within the radiology community about error disclosure practices can be a natural and logical extension of discourse that has burgeoned in radiology around patient-centeredness and quality and safety. Radiology-specific guidance issued by leaders in patient-centeredness and quality and safety—in collaboration with experts in peer review, legal affairs, and institutional culture—would help achieve norms and suggest solutions around a closely related area, error disclosure, where consensus on best practices still does not exist. Discourse among thought leaders in these domains could be harnessed to help radiologists respond optimally when called on either to establish and support their local institutional initiatives or to participate in direct communication with patients and families when events occur. Given the relative paucity of literature about error disclosure specific to radiologic practice, further dialogue

would raise awareness about emerging expectations and national developments and help radiologists better appreciate institutional mechanisms necessary to identify errors and successfully implement disclosure processes.

Even where individual radiologists' home institutional policies hold sway when questions arise over communicating with patients and families about radiologic errors and adverse events, a more formal and collective understanding within radiology will diminish skeptics' views that error allocation in radiology is particularly capricious and indistinct because of its intrinsic subjectivity. More discourse would be helpful to promote normalization of honesty as it relates to early event reporting, communication among peers, and openness with patients, and it would help generate a more uniform understanding and acceptance of how to manage the identification and communication of errors made by other physicians (including radiologists outside their practice domain). Further concerted dialogue within radiology would be helpful to elucidate solutions to practical matters, such as team meetings, disclosure training, coaching, just-in-time learning, and determination of who should be present during the disclosure conversation (67). Such dialogue would be advanced by soliciting experiences among radiologists who practice in institutions with established CRPs. To date, no such experiences have been published in the radiology literature.

Conclusion

Strong cultural currents are driving radiologists inexorably toward situations where we will be required to disclose our errors to patients. This requirement will likely intensify as more systems establish broad initiatives around disclosure and apology and as legislative and procedural barriers are remedied. Some radiologists may wish to disclose their errors directly to patients, while others who are resistant to disclosure may soon find the expectation imposed on them by their institution. In either case, widespread direct radiologist-to-patient disclosure and apologies for errors creates a cultural shift within our specialty for which most radiologists remain ill prepared.

Fortunately, compared with even 5 years ago, detailed, albeit general, guidelines and roadmaps have been established, including those issued by the Agency for Healthcare Research and Quality's Communication and Optimal Resolution program and the Collaborative for Accountability and Improvement. However, communication with patients and families about radiologic errors seems likely to remain ad hoc in the absence of described experiences, explicit professional directives, or consensus-driven recommendations on best practices. Considerable work remains regarding the definitions of radiologic errors, medicolegal liability, thresholds for disclosure, and radiologists' roles in the health care communication process.

Radiologists advancing this discussion now will help the profession proactively develop a set of best practices. Radiologists with expertise in patient-centered care, quality, and safety are well positioned to lead the discourse, given that communicating with patients and families about adverse events and errors is a natural expression of priorities within these domains. These leaders could be joined by experts in peer review, legal affairs, and institutional processes who are well represented within radiology. Ultimately, roadmaps and guidance tailored to radiologic practice would greatly help radiologists prepare further for their unique challenges. We anticipate that much debate will take place regarding the best path forward. The foresight and participation of radiology as an architect would be one choice, as opposed to our lagging behind legislative mandates, institutional pressures, and underdelivered patient expectations.

Disclosures of Conflicts of Interest: **S.D.B.** disclosed no relevant relationships. **M.A.B.** disclosed no relevant relationships. **J.Y.S.** disclosed no relevant relationships. **R.E.** disclosed no relevant relationships. **H.A.** Activities related to the present article: disclosed no relevant relationships. Activities not related to the present article: received royalties from Oxford University Press and Elsevier. Other relationships: disclosed no relevant relationships. **A.N.** Activities related to the present article: disclosed no relevant relationships. Activities not related to the present article: is a board member of Boston Imaging Core Laboratories; is a scientific advisor for Stryker, GE Healthcare, GE Data, IBM Watson, and Penumbra; receives royalties from Boston Imaging Core Laboratories; has stock in Boston Imaging Core Laboratories. Other relationships: disclosed no relevant relationships. **T.H.G.** Activities related to the present article: disclosed no relevant relationships. Activities not related to the present article: institution received a grant from the BETA Healthcare Group. Other relationships: disclosed no relevant relationships.

References

1. Gallagher TH, Studdert D, Levinson W. Disclosing harmful medical errors to patients. N Engl J Med 2007;356(26):2713–2719.
2. McDonald TB, Van Niel M, Gocke H, Tarnow D, Hatlie M, Gallagher TH. Implementing communication and resolution programs: Lessons learned from the first 200 hospitals. J Patient Saf Risk Manag 2018;23(2):73–78.
3. Mello MM, Armstrong SJ, Greenberg Y, McCotter PI, Gallagher TH. Challenges of Implementing a Communication-and-Resolution Program Where Multiple Organizations Must Cooperate. Health Serv Res 2016;51(Suppl 3):2550–2568.
4. Mello MM, Boothman RC, McDonald T, et al. Communication-and-resolution programs: the challenges and lessons learned from six early adopters. Health Aff (Millwood) 2014;33(1):20–29.
5. Mello MM, Kachalia A, Roche S, et al. Outcomes In Two Massachusetts Hospital Systems Give Reason For Optimism About Communication-And-Resolution Programs. Health Aff (Millwood) 2017;36(10):1795–1803.
6. Wu AW, McCay L, Levinson W, et al. Disclosing Adverse Events to Patients: International Norms and Trends. J Patient Saf 2017;13(1):43–49.
7. Kachalia A, Mello MM, Nallamothu BK, Studdert DM. Legal and Policy Interventions to Improve Patient Safety. Circulation 2016;133(7):661–671.
8. Brown SD, Lehman CD, Truog RD, Browning DM, Gallagher TH. Stepping out further from the shadows: disclosure of harmful radiologic errors to patients. Radiology 2012;262(2):381–386.
9. Barron BJ, Banja J. Radiologic reporting: the ethical obligation of the interpreting physician to provide an accurate report. AJR Am J Roentgenol 2013;201(2):356–360.
10. Berlin L. The mea culpa conundrum. Radiology 2009;253(2):284–287.
11. Berlin L. To disclose or not to disclose radiologic errors: should "patient-first" supersede radiologist self-interest? Radiology 2013;268(1):4–7.
12. Gallagher TH, Cook AJ, Brenner RJ, et al. Disclosing harmful mammography errors to patients. Radiology 2009;253(2):443–452.
13. Baker S, Lauro C, Sintim-Damoa A. Malpractice allegations and apology laws: benefits and risks for radiologists. J Am Coll Radiol 2008;5(12):1186–1190.
14. American College of Radiology, European Society of Radiology, Radiological Society of North America, et al. Ethics of AI in Radiology: European and North American Multisociety Statement. https://www.acr.org/-/media/DSI/Files/PDFs/Ethics-of-AI-in-Radiology-Statement_RFC.pdf?la=en. Published February 26, 2019. Accessed April 14, 2019.
15. Institute of Medicine. To err is human: building a safer health system. Washington, DC: National Academies Press, 2000.
16. Wu AW, Boyle DJ, Wallace G, Mazor KM. Disclosure of adverse events in the United States and Canada: an update, and a proposed framework for improvement. J Public Health Res 2013;2(3):e32.
17. National Quality Forum. Safe Practices for Better Healthcare–2009 Update: A Consensus Report. Washington, DC: National Quality Forum, 2009.
18. Leape L, Berwick D, Clancy C, et al. Transforming healthcare: a safety imperative. Qual Saf Health Care 2009;18(6):424–428.
19. The Joint Commission. Hospital Accreditation Standards. Patient Safety Systems. https://www.jointcommission.org/assets/1/6/PS_chapter_AHC_2018.pdf. Published December 18, 2017. Accessed April 14, 2019.
20. Gallagher TH, Mello MM, Sage WM, Bell SK, McDonald TB, Thomas EJ. Can Communication-And-Resolution Programs Achieve Their Potential? Five Key Questions. Health Aff (Millwood) 2018;37(11):1845–1852.

21. Abujudeh H, Pyatt RS Jr, Bruno MA, et al. RADPEER peer review: relevance, use, concerns, challenges, and direction forward. J Am Coll Radiol 2014;11(9):899–904.
22. Alkasab TK, Harvey HB, Gowda V, Thrall JH, Rosenthal DI, Gazelle GS. Consensus-oriented group peer review: a new process to review radiologist work output. J Am Coll Radiol 2014;11(2):131–138.
23. Etchegaray JM, Gallagher TH, Bell SK, Dunlap B, Thomas EJ. Error disclosure: a new domain for safety culture assessment. BMJ Qual Saf 2012;21(7):594–599.
24. Radiological Society of North America. RSNA Bylaws: Code of Ethics. 9.10. https://www.rsna.org/uploadedFiles/RSNA/Content/About_RSNA/RSNA_bylaws.pdf. Published November 25, 2018. Accessed April 14, 2019.
25. Hryhorczuk AL, Hanneman K, Eisenberg RL, Meyer EC, Brown SD. Radiologic Professionalism in Modern Health Care. RadioGraphics 2015;35(6):1779–1788.
26. American Medical Association. AMA Code of Medical Ethics. Opinion 2.1.3. https://www.ama-assn.org/delivering-care/ethics/withholding-information-patients. Accessed April 14, 2019.
27. American College of Obstetricians and Gynecologists. Committee Opinion 681: Disclosure and Discussion of Adverse Events. https://www.acog.org/-/media/Committee-Opinions/Committee-on-Patient-Safety-and-Quality-Improvement/co681.pdf?dmc=1&ts=20190414T2058239437. Published December 2016 (Reaffirmed 2019). Accessed April 14, 2019.
28. Sulmasy LS, Bledsoe TA; ACP Ethics, Professionalism and Human Rights Committee. American College of Physicians Ethics Manual: Seventh Edition. Ann Intern Med 2019;170(2_Supplement):S1–S32..
29. Barry MJ, Edgman-Levitan S. Shared decision making--pinnacle of patient-centered care. N Engl J Med 2012;366(9):780–781.
30. Berger ZD, Brito JP, Ospina NS, et al. Patient centred diagnosis: sharing diagnostic decisions with patients in clinical practice. BMJ 2017;359:j4218.
31. Truog RD. Patients and doctors--evolution of a relationship. N Engl J Med 2012;366(7):581–585.
32. Institute of Medicine. Crossing the Quality Chasm: A New Health System for the 21st Century. Washington, DC: National Academies Press, 2001.
33. Kemp JL, Mahoney MC, Mathews VP, Wintermark M, Yee J, Brown SD. Patient-centered Radiology: Where Are We, Where Do We Want to Be, and How Do We Get There? Radiology 2017;285(2):601–608.
34. Uyeda JW, Kitts AB, Rybicki FJ. The ACR Appropriateness Criteria® Patient Engagement Subcommittee. J Am Coll Radiol 2019;16(3):e9–e10.
35. Gallagher THA. A 62-year-old woman with skin cancer who experienced wrong-site surgery: review of medical error. JAMA 2009;302(6):669–677.
36. Moore J, Bismark M, Mello MM. Patients' Experiences With Communication-and-Resolution Programs After Medical Injury. JAMA Intern Med 2017;177(11):1595–1603.
37. Sage WM. Medical liability and patient safety. Health Aff (Millwood) 2003;22(4):26–36.
38. Clinton HR, Obama B. Making patient safety the centerpiece of medical liability reform. N Engl J Med 2006;354(21):2205–2208.
39. Kachalia A, Mello MM. New directions in medical liability reform. N Engl J Med 2011;364(16):1564–1572.
40. Sage WM, Gallagher TH, Armstrong S, et al. How policy makers can smooth the way for communication-and-resolution programs. Health Aff (Millwood) 2014;33(1):11–19.
41. Commonwealth of Massachusetts 191st General Court, General Laws, 233:79L(b). https://malegislature.gov/Laws/GeneralLaws/PartIII/TitleII/Chapter233/Section79L. Accessed April 14, 2019.
42. Mastroianni AC, Mello MM, Sommer S, Hardy M, Gallagher TH. The flaws in state 'apology' and 'disclosure' laws dilute their intended impact on malpractice suits. Health Aff (Millwood) 2010;29(9):1611–1619.
43. Institute for Healthcare Improvement. Stanford cuts liability premiums with cash offers after errors. http://www.ihi.org/about/news/Pages/StanfordCutsLiabilityPremiums.aspx. Published 2011. Accessed April 14, 2019.
44. Kachalia A, Kaufman SR, Boothman R, et al. Liability claims and costs before and after implementation of a medical error disclosure program. Ann Intern Med 2010;153(4):213–221.
45. Institute of Medicine. Improving Diagnosis in Health Care. Washington, DC: National Academies Press, 2015.
46. Abujudeh HH. "Just culture": is radiology ready? J Am Coll Radiol 2015;12(1):4–5.
47. Burns J, Miller T, Weiss JM, Erdfarb A, Silber D, Goldberg-Stein S. Just Culture: Practical Implementation for Radiologist Peer Review. J Am Coll Radiol 2019;16(3):384–388.
48. Agency for Healthcare Research and Quality. Care for the Caregiver Program Implementation Guide. https://www.ahrq.gov/professionals/quality-patient-safety/patient-safety-resources/resources/candor/module6-guide.html. Published 2018. Accessed April 14, 2019.
49. McDonald TB, Helmchen LA, Smith KM, et al. Responding to patient safety incidents: the "seven pillars". Qual Saf Health Care 2010;19(6):e11.
50. CRICO RMF. CRICOs Approach to Disclosure of Medical Error and Compensation. https://www.rmf.harvard.edu/Clinician-Resources/Article/2012/CRICOs-Approach-to-Disclosure-of-Medical-Error-and-Compensation. Published 2012. Accessed April 14, 2019.
51. BETA Healthcare Group. BETA HEART. https://www.betahg.com/risk-management-and-safety/beta-heart/. Published 2018. Accessed April 14, 2019.
52. Studdert DM, Mello MM, Gawande AA, Brennan TA, Wang YC. Disclosure of medical injury to patients: an improbable risk management strategy. Health Aff (Millwood) 2007;26(1):215–226.
53. Bruno MA. 256 Shades of gray: uncertainty and diagnostic error in radiology. Diagnosis (Berl) 2017;4(3):149–157.
54. Abujudeh HH, Boland GW, Kaewlai R, et al. Abdominal and pelvic computed tomography (CT) interpretation: discrepancy rates among experienced radiologists. Eur Radiol 2010;20(8):1952–1957.
55. Lee CS, Nagy PG, Weaver SJ, Newman-Toker DE. Cognitive and system factors contributing to diagnostic errors in radiology. AJR Am J Roentgenol 2013;201(3):611–617.
56. Pinto A, Brunese L. Spectrum of diagnostic errors in radiology. World J Radiol 2010;2(10):377–383.
57. Taylor GA, Voss SD, Melvin PR, Graham DA. Diagnostic errors in pediatric radiology. Pediatr Radiol 2011;41(3):327–334.
58. Bruno MA, Walker EA, Abujudeh HH. Understanding and Confronting Our Mistakes: The Epidemiology of Error in Radiology and Strategies for Error Reduction. RadioGraphics 2015;35(6):1668–1676.
59. Fernald DH, Pace WD, Harris DM, West DR, Main DS, Westfall JM. Event reporting to a primary care patient safety reporting system: a report from the ASIPS collaborative. Ann Fam Med 2004;2(4):327–332.
60. Truog RD, Browning DM, Johnson JA, Gallagher TH. Talking with patients and families about medical error. Baltimore, Md: Johns Hopkins University Press, 2011.
61. West D, Westfall JM, Araya-Guerra R, et al. Using reported primary care errors to develop and implement patient safety interventions: a report from the ASIPS Collaborative. In: Advances in Patient Safety: From Research to Implementation. AHRQ Publication No. 050021. Rockville, Md: Agency for Healthcare Research and Quality, 2005.
62. Toms AP. Errors in Radiology. In: Peh WCG, ed. Pitfalls in Musculoskeletal Radiology. Cham, Switzerland: Springer International Publishing, 2017; 165–177.
63. Chamberlain CJ, Koniaris LG, Wu AW, Pawlik TM. Disclosure of "nonharmful" medical errors and other events: duty to disclose. Arch Surg 2012;147(3):282–286.
64. Gallagher TH, Mello MM, Levinson W, et al. Talking with patients about other clinicians' errors. N Engl J Med 2013;369(18):1752–1757.
65. Communication and Optimal Resolution (CANDOR) Toolkit. https://www.ahrq.gov/professionals/quality-patient-safety/patient-safety-resources/resources/candor/introduction.html. Published 2018. Accessed April 14, 2019.
66. Collaborative for Accountability and Improvement. Communication and Resolution Programs. http://communicationandresolution.org/communication-and-resolution-programs/. Published 2018. Accessed April 14, 2019.
67. Truog R, Browning D, Johnson J, et al. Talking with Patients and Families about Medical Error: A Guide for Education and Practice. Baltimore, Md: Johns Hopkins University Press, 2011.