INNOVATIONS JOURNALS

Editorial

Learning From Mistakes: Navigating Medical Errors in Oncology From Prevention to Management

Daniel D. Karp,[1] Jessica A. Osburn,[1] Mohamed A. Gouda[1]

[1]Department of Investigational Cancer Therapeutics, The University of Texas MD Anderson Cancer Center, Houston, TX, USA

Address correspondence to Mohamed A. Gouda (mgouda@mdanderson.org).

Source of Support: This work was supported by the National Center for Advancing Translational Sciences (UL1 TR000371) and the National Institutes of Health through MD Anderson's Cancer Center Support Grant (P30CA016672). Conflicts of Interest: None.

Submitted: May 19, 2024; First Revision Received: Aug 5, 2024; Accepted: Aug 29, 2024; First Published: Oct 10, 2024.

Karp DD, Osburn JA, Gouda MA. Learning from mistakes: navigating medical errors in oncology from prevention to management. *J Immunother Precis Oncol*. 2024; 7:242–246. DOI: 10.36401/JIPO-24-21.

Keywords: medical errors, medicine, oncology

INTRODUCTION

Mistakes are part of human life. The subspecialty of medical oncology is no exception. In Boston, Massachusetts, in 1994, Betsy Lehman, the 39-year-old health reporter for the *Boston Globe*, was being treated with a new, high-dose chemotherapy breast cancer clinical trial. A junior physician wrote the order "4000-mg cyclophosphamide over 4 days." Instead of the patient receiving 1000 mg/m^2 daily for 4 days as intended, Ms. Lehman inadvertently received 4000 mg/m^2 each day for 4 days. The patient received a total dose of 26,080 mg, which led to severe cardiac damage and ultimately cost the young reporter her life. Two days later, a second patient developed permanent cardiac damage when the same issue reoccurred.[1] In the aftermath of such sentinel events, extensive media coverage and the public sought answers, while those closely involved were left soul-searching. Over a dozen nurses, doctors, and pharmacists were involved in the treatment plan, and yet there tragically was no alarm to prevent the massive cyclophosphamide overdose. As part of the effort to prevent this mistake from recurring, a series of correctional steps and systems were developed to ensure patients' safety. Ultimately, however, medical errors will continue to occur—despite a physician's effort to do "the right thing." In 2016, a study estimated that upward of 250,000 patient deaths were related to preventable complications of medical care, ranking third among causes of death in the United States.[2] While this striking estimate remains controversial, the number of milder adverse events related to medical errors may be even higher. Mistakes, of all severities, are part of human nature. The goal should be to learn from prior mistakes and develop new strategies to minimize preventable errors.

In this article, we discuss examples of medical errors and individualized approaches providers can try to incorporate into their practice to help reduce their occurrence. These strategies are based on cumulative experience of more than 50 years in clinical oncology. We will borrow from other well-known, highly effective operations in other commercial settings and give 10 valuable hints and habits that, if followed, can lead to more efficient practice and less clinical error. We will also discuss how to ameliorate the medical consequences and minimize patient impact in the event of a clinical error.

EXAMPLES OF MEDICAL ERRORS

The consequences of medical errors lie somewhere within the spectrum of minor to catastrophic, but as history has taught us, even simple errors can lead to serious, harmful complications that can permanently affect a patient's life (Box 1). In general, medical errors can be classified into errors of omission and errors of commission. In the former, complications occur as a result of failing to take certain actions (e.g., not stabilizing a gurney prior to the patient's transfer, which could expose the patient to injury or fall). In the latter, complications occur as a result of wrongdoing (e.g., administering a harmful agent to a patient with a known medication allergy).[3] An example related to the oncology field would be a failure to obtain appropriate genetic

testing, which could be actionable in the context of cancer management.

Box 1: Examples of medical errors

Misdiagnosis: when in doubt, consult with a colleague
Never errors (e.g., wrong treatment/wrong patient, wrong site surgery)
Preventable adverse drug reactions
Treatment-related infections, especially with indwelling catheters
Failure of equipment or therapy
Alpha errors: the mistaken idea that treatment is beneficial but is not
Beta errors: premature discontinuation of treatment that was actually helping

In the world of modern medicine, electronic medical records (EMRs) play a pivotal role in coordinating and harmonizing patient care, particularly in the context of oncology clinical trials requiring a multidisciplinary team approach. Patient medical records serve as a safety mechanism to prevent both errors of omission and commission, but this prevention relies on up-to-date, detailed documentation. A study reviewing the relationship between the completeness of medical records and the incidence of adverse events revealed a possible inverse correlation between the completeness of records and the total number of adverse events.[4]

A failure of medical documentation can lead to a serious clinical error. A common example in the realm of oncology is clinical toxicity and efficacy associated with the duration of infusion administration.[5] The slowing of intravenous (IV) infusions has long been practiced in oncology to improve patient tolerance to anticancer therapies. However, changes in the rate of IV medication administration can affect drug safety and outcomes. Providers must order, verify, infuse, and document IV infusions to ensure treatments are completed as intended.

Documentation is essential to preventing errors. Reports on wrong-site surgical procedures have been published, and, unfortunately, fatal complications have been documented.[6,7] One such procedure resulted from the transposition of a patient's X-ray. This transposition led to a right/left reversal, and instead of the successful excision of a patient's cancerous kidney, surgeons removed the healthy kidney. The simple technique of marking the proper side for surgery at the preoperative visit has been highly effective in eliminating wrong-site surgery.

While the list of reported medical errors remains extensive (Box 1), they share the following things in common: human error, miscommunications, and systems without proper safeguards.

STRATEGIES TO PREVENT AND MITIGATE MEDICAL ERRORS

Using strategies to prevent and mitigate medical errors is essential to medical practice (Box 2). Such strategies that include the use of novel technologies which require forcing functions-, clear communications, and accountability without blame facilitate improved performance, and reduce provider error (Fig. 1). Moreover, adhering to general rules for efficient medical practice can reduce the risk of clinical error. In the next sections, we elaborate on simple strategies and tactics that are very helpful in minimizing the occurrence of medical errors.

Box 2: Ten rules for effective and less error prone practice

1. Start your day early and plan ahead. You can fix things before the day gets started.
2. Line up your tasks. Use algorithms and forcing functions whenever applicable.
3. Divide (slice and dice) tasks. Perform complicated procedures one step at a time.
4. Avoid interruptions. Use cockpit rules. Repeat instructions back to your colleague.
5. Make checklists and use colors green (go), red (stop), and yellow (think, caution).
6. Determine A-list items that only you can do. Do what matters most first.
7. Work 90 minutes at a time. Take breaks. Check your email only 2-3 times/d.
8. Sleep well. Sleep deprivation can lead to bad harmful decisions.
9. Make the digital world your servant, not your master.
10. Build strong relationships. Be kind and humble. People will rally to help you.

Partly based upon suggestions discussed in *Eat That Frog* by Brian Tracy.[14]

Write Clearly and Concisely

Although EMRs have largely replaced historical handwritten records, physicians and medical staff still use handwritten notes and documentation to some extent. Thus, to prevent misinterpretation, one's handwriting should always be clear and easy to interpret—it should not be liable to multiple interpretations by different personnel. Clear, precise, and efficient legible instructions ensure that what was intended and what is executed are one in the same. Anticancer therapy orders, including chemotherapy orders, must be explicit and protected against misinterpretation. Letters and numbers must be written impeccably, and the use of numbers and corresponding words makes errors much less likely (Fig. 2). The consequences of unclear handwriting or confusing statements can be devastating, as in the case of Ms. Lehman. Differences in the common date formats between different regions

Figure 1. The "secret sauce" for eliminating medical errors is clear, unambiguous communication and forcing functions. If an error does occur, be accountable and humble. Take ownership if it is appropriate. Do not blame others. Do not be defensive. Patients know doctors and nurses are human. Be kind and respectful.

worldwide (e.g., mm/dd/yyyy and dd/mm/yyyy) can lead to confusion. They can simply be avoided by writing the month in words.

Use Clear Instructions

It is imperative that patients become involved in their medical care and have a clear understanding of the next step. Providers may consider the teach-back method to ensure patient understanding. Using this method, the care provider instructs the patient on the plan of care and requests the patient to restate the plan to the provider. This method is extremely helpful to both the provider and the patient as both parties confirm an understanding of the clinical plan. A limitation to clear communication is that of a language barrier. While this barrier is often navigated with the assistance of an interpreter, the challenge of a third-party member becomes a limitation in oneself. The use of an interpreter is essential to provider–patient communication; however, the provider should designate additional time and effort for these visits to ensure instructions are relayed appropriately and not simply lost in translation. Additionally, one could use different tools such as pictograms, colors, checklists, and highlighting to help clarify instructions and assist with proper patient interpretation.

Have a Huddle

It is imperative to have a "timeout" or short meeting before patient care. While this is standard practice before and after surgical procedures, it is highly advised before and after patient engagement in outpatient clinics. This meeting allows providers to prepare and debrief (i.e., to review what went right and what went wrong). The practice of continuous review keeps providers engaged, allows them to learn from their mistakes, and works to improve future performance. This practice, in turn, leads to better medical care. Further, it can improve provider morale through strong collaboration, effective communication, and clinical understanding.

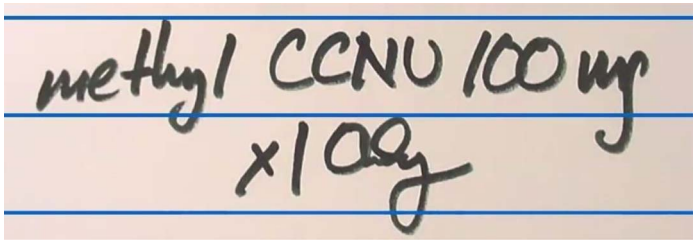

Figure 2. A facsimile of a real-life example from the 1980s where an experienced nurse practitioner wrote a progress note specifying methyl CCNU 100 mg to be given for "×1 only." A junior resident covering on a Saturday morning misinterpreted the directions and ordered methyl CCNU 100 mg × 1 day; this resulted in prolonged severe myelosuppression. An inexperienced pharmacist covering on the weekend failed to recognize the overdose. This sentinel event, which resulted in prolonged severe myelosuppression, was the impetus to require at least two signatures for all chemotherapy orders.

Ensure Proper Handoff

Failure of proper communication between healthcare team members can have serious consequences. This risk reaches its peak during transitions of care. Hence comes the importance of handoff communication as a tool to minimize any jeopardy in patient safety between different shifts and providers. Many handoff approaches have been developed and adapted by healthcare teams to minimize communication errors. One example is the I-PASS (illness severity, patient summary, action list, situation awareness and contingency planning, and synthesis by receiver) approach, which has been shown to reduce medical errors and preventable adverse events related to care transitions.[8] It is essential that teams adhere to an organized handoff communication method to provide safe patient care.

Use Forcing Functions

A forcing function is a tool to ensure necessary actions are completed and reviewed by different team members before order execution. This function works to reduce the risk of single provide-driven mistakes. As the forcing function requires input from different team members before order execution, there is a greater chance of identifying an error before its occurrence. Incorporating forcing functions into EMRs has dramatically changed how orders are entered, approved, and executed and significantly improved patient safety. It is important to keep mindfulness while using forcing functions, as those can backfire when practitioners routinely approve the orders without second thoughts. As discussed in a later section, technology can be very helpful as a tool without compromising human input.

Appropriately Navigate Branch-Point Decisions

A common issue that medical oncologists face is the requirement to make advanced decisions about patient care with limited clinical information. This often occurs when patients present for treatment clearance and the radiology report is still pending or pertinent laboratory results are still in process. It is important to never assume that everything is normal. Surprises happen, and one result can be the difference between a patient who is and is not medically fit to receive treatment. A provider should never have to make a treatment decision when the required information is not yet finalized. A treatment delay is always better than patient harm. Patients may be upset at the delay, but patient safety takes top priority. Whenever possible, one should try to avoid "ready-fire-aim" situations, where providers are being asked to make a decision before having the opportunity to thoroughly review and possibly discuss clinical results and plan of care.

Proper Identification

While the world of modern oncology is extremely complex, one may be surprised how simple acts of identification and verification can prevent serious consequences. In every patient encounter, it is important to verify a patient's identity (via name, date of birth, and medical record number), detailed treatment protocol (drug description including class), treatment calendar (cycle/day), medication (drug name and alias), treatment dosing, and route of administration. Proper identification should not solely depend on an effective labeling system but rather a verification system.

Bond with the Patient

Providers are consistently pressured to spend less time with their patients. This pressure comes from the rising patient clinical demand. A rising census limits providers' time to make personal connections with patients; this limitation can exacerbate potential medical errors. It is important to make a personal connection with patients as this connection helps establish a trust, bond, and positive relationship between provider and patient. Use this tip: ask patients where they grew up, what work they have done, and what they care about. Taking a minute to ask a personal question will pay big dividends, especially when you may need to have a difficult care goal discussion.

One Thing at a Time

Despite the incredible ability of the human brain, an error can occur in the environment of distraction. It is important to minimize distractions in the work setting and approach one thing at a time. A tragic example to this point occurred when a hospital pharmacy delivered multiple syringes to a physician who was preparing to administer intrathecal methotrexate and intravenous vincristine. Given the comingling of syringes, the physician accidentally delivered the syringe of vincristine intrathecally, leading to sudden and catastrophic consequences.[9] An additional measure adopted by the medical community is that of a "time-out." During this time out, surgeons verify and clearly mark the correct body part to ensure the surgery will be performed on the intended site. These two maneuvers of avoiding "comingling" and adopting a "time-out" have been very effective in reducing distractions and confirming "right treatment, right patient, right dose."

Avoid Learning Curve Errors

Training and education are integral to the medical environment to produce the next generation of healthcare workers. However, those at an early stage of their careers with less experience are more prone to mistakes. Proper orientation, continuous mentorship, and supervision can help to avoid issues during the early phases of the learning curve. When the next generation of healthcare workers is taught the importance of taking responsibility, providers ensure the standards for patient safety remain high.

Accountability

It is important to understand that being frank and truthful is always the best approach. In the event of a medical error, providers should discuss it openly and apologetically with patients and their families. In most instances, those impacted are understanding and appreciate provider transparency and accountability. Once addressed, physicians should do their best to ameliorate any medical consequences related to these errors. Discussing and disclosing errors to regulatory authorities can help ameliorate the mistake and prevent its recurrence at both personal and institutional levels. Accountability can only occur if providers work within a nurturing culture of support rather than blame. As previously mentioned, doctors, nurses, and additional healthcare team members do not intend to harm their patients, but mistakes happen. A supportive work model is necessary to address and reconcile medical errors. The focus of accountability should not be on portraying medical errors as crimes and patients as victims but rather as human experiences that we acknowledge, learn from, and search for solutions to prevent. In an atmosphere of blame, healthcare professionals would be reluctant to report their mistakes for fear of punishment, which is a complete system failure.[10–12]

TECHNOLOGY, ARTIFICIAL INTELLIGENCE, AND MEDICAL ERRORS

The use of technology has substantially impacted the practice of medicine for the better, but in certain situations, it increases liability.[13] The use of EMRs enhances compliance with record completeness and incorporates

forcing functions to minimize medical error, but this comes with its own set of challenges. The use of EMRs has its own risk of incorrect documentation and the burden of time. The use of telemedicine revolutionized amid the COVID-19 pandemic. While virtual care has expanded medical access, the limitations to physical evaluation, estimation of performance status, and examination greatly restrict professionals in their identification of clinical concerns. Artificial intelligence (AI) is another technological advancement that comes with uncertainty. While the proposed use of AI can largely facilitate patient care, there are limitations to accuracy and concerns surrounding accountability in the event of medical error. In general, technology is a double-edged sword, and physicians should wield it with caution. One cannot rely on technology alone in medical care. The human brain is no match for the computer's ability to create lists and record a large number of items. However, the key to high-quality medical care is contained in the word *"care"—not medical*. The computer will never be a substitute for kindness and the human traits that encourage, soothe, and comfort patients battling severe medical conditions.

CONCLUSION

Medical errors can happen as mistakes are part of human nature. We must try our best to avoid this by using intuitive tools to prevent mistakes and professionally navigating situations when these errors happen. Building a solid therapeutic relationship with our patients, making them a partner in medical care, and using clear communications and proper safeguards during medical practice can make medical care faster, more effective, and less error-prone.

Reference

1. Big doses of chemotherapy drug killed patient, hurt 2d. *New York Times*. Accessed Jan 1 2024. www.nytimes.com/1995/03/24/us/big-doses-of-chemotherapy-drug-killed-patient-hurt-2d.html
2. Makary MA, Daniel M. Medical error-the third leading cause of death in the US. *BMJ*. 2016;353:i2139.
3. Rodziewicz TL, Houseman B, JE. H. *Medical Error Reduction and Prevention*. StatPearls Publishing; 2024.
4. Scarpis E, Cautero P, Tullio A, et al. Are adverse events related to the completeness of clinical records? Results from a retrospective records review using the Global Trigger Tool. *Int J Qual Health Care*. 2023;35:mzad094.
5. Meta-analysis Group In Cancer; Piedbois P, Rougier P, et al. Efficacy of intravenous continuous infusion of fluorouracil compared with bolus administration in advanced colorectal cancer. *J Clin Oncol*. Jan 1998;16:301–308.
6. Dyer O. Doctors suspended for removing wrong kidney. *BMJ*. 2004;328:246.
7. Mulloy DF HR, RG H, ed. *Patient Safety and Quality: An Evidence-Based Handbook for Nurses*. Agency for Healthcare Research and Quality; 2008.
8. Blazin LJ, Sitthi-Amorn J, Hoffman JM, Burlison JD. Improving patient handoffs and transitions through adaptation and implementation of I-PASS across multiple handoff settings. *Pediatr Qual Saf*. 2020;5:e323.
9. Chotsampancharoen T, Sripornsawan P, Wongchanchailert M. Two fatal cases of accidental intrathecal vincristine administration: learning from death events. *Chemotherapy*. 2016;61:108–1–10.
10. Delacroix R. Exploring the experience of nurse practitioners who have committed medical errors: a phenomenological approach. *J Am Assoc Nurse Pract*. 2017;29:403–409.
11. Helo S, Moulton CE. Complications: acknowledging, managing, and coping with human error. *Transl Androl Urol*. 2017;6:773–782.
12. Robertson JJ, Long B. Suffering in silence: medical error and its impact on health care providers. *J Emerg Med*. 2018;54:402–409.
13. Lawes S, Grissinger M. Medication errors attributed to health information technology. Pennsylvania Patient Safety Authority. 2017. Accessed Jan 1, 2024. patientsafety.pa.gov/advisories/documents/201703_HITmed.pdf
14. Tracy B. *Eat That Frog!: 21 Great Ways to Stop Procrastinating and Get More Done in Less Time*. 3rd Ed. Berrett-Koehler Publishers; 2017.