The Wrong Patient

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Among all types of medical errors, cases in which the wrong patient undergoes an invasive procedure are sufficiently distressing to warrant special attention. Nevertheless, institutions underreport such procedures, and the medical literature contains no discussions about them. This article examines the case of a patient who was mistakenly taken for another patient's invasive electrophysiology procedure. After reviewing the case and the results of the institution's "root-cause analysis," the discussants discovered at least 17 distinct errors, no single one of which could have caused this adverse event by itself. The discussants illustrate how these specific "active" errors interacted with a few underlying "latent conditions" (system weaknesses) to cause harm. The most remediable of these were absent or misused protocols for patient identification and informed consent, systematically faulty exchange of information among caregivers, and poorly functioning teams.

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"Quality Grand Rounds" is a series of articles and companion conferences designed to explore a range of quality issues and medical errors. Presenting actual cases drawn from institutions around the United States, the articles integrate traditional medical case histories with results of root-cause analyses and, where appropriate, anonymous interviews with the involved patients, physicians, nurses, and risk managers. Cases do not come from the discussants' home institutions.

Summary of Events

Joan Morris (a pseudonym) is a 67-year-old woman admitted to a teaching hospital for cerebral angiography. The day after that procedure, she mistakenly underwent an invasive cardiac electrophysiology study.

The patient, a native English speaker and high school graduate whose daughter is a physician, had been well until several months earlier, when she fell and struck her head. Magnetic resonance imaging showed two large cerebral aneurysms. The interventional radiology service admitted her for cerebral angiography.

The day after admission, cerebral angiography was performed, and one of the aneurysms was successfully embolized. The second aneurysm was deemed more amenable to surgical therapy, for which a subsequent admission was planned. After angiography, the patient was transferred to the oncology floor rather than returning to her original bed on the telemetry unit. Discharge was planned for the following day. The next morning, however, the patient was taken for an invasive cardiac electrophysiology study. Approximately 1 hour into the procedure, it became apparent that Ms. Morris was the wrong patient. The study was aborted, and she was returned to her room in stable condition.

Performing an Invasive Procedure on the Wrong Patient

Of all of the errors we make in delivering health care, this case surely represents one of the most disturbing. Despite occasional local news coverage of such adverse events (1–3), few data are available to document their incidence. The Joint Commission on Accreditation of Healthcare Organizations maintains a national database of "sentinel events" (4, 5), which include errors such as this one. Reporting to the Joint Commission is voluntary; the database contains 17 reports of an invasive procedure done on the wrong patient over the past 7 years (Schyve P. Personal communication, 31 January 2002). Additional information about adverse events is compiled by individual states, at least 15 of which maintain their own error-reporting systems (6). New York State has a long-standing and recently revised mandatory reporting system; it has received reports of 27 "incorrect patient/invasive procedure" incidents from April 1998 through December 2001 (Heigel F. Personal communication, 14 February 2002).

The marked disparity in the number of events chronicled by these two databases—one voluntary, one

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mandatory—suggests that the voluntary Joint Commission database is incomplete (5). But even mandatory state reporting systems may underestimate the true incidence of "wrong-patient" procedures. All error-reporting systems depend on hospitals' internal incident reports as sources for their data, and research has shown that clinicians file incident reports for only a small percentage of actual errors (7–9). A recent analysis of the New York system, for example, determined that for one of the adverse events for which reporting is required (deaths within 48 hours of surgery), only 16% of cases were reported in 1999 (10, 11).

The medical literature is largely silent about this problem. We found a small number of studies showing errors of patient misidentification in the transfusion of blood products (12), injection of radionuclide material (13), and administration of chemotherapy (14). We could not find a single study or case report on the problem of wrong-patient invasive procedures. Although the New York data may provide a lower bound frequency estimate, given the dearth of research and the limitations of error-reporting systems, we conclude that we do not know how often this type of event occurs. However rarely these events occur, all health care delivery systems should strive to eliminate them entirely.

Chronology of Events

Another patient, a 77-year-old woman with a similar name (Jane Morrison, a pseudonym) had been transferred from an outside hospital for a cardiac electrophysiology procedure and was also admitted to the telemetry unit. Ms. Morrison's procedure, which had been delayed for 2 days, was scheduled as the first electrophysiology case for the early morning of the day of Ms. Morris's planned discharge.

6:15 a.m. *The electrophysiology nurse (RN_1) logged on to the electrophysiology laboratory computer to check the morning schedule and saw Jane Morrison listed as the first case. (The electrophysiology laboratory's computer system is separate from the main hospital system and does not exchange information with it.) RN_1 telephoned the telemetry floor, identified herself by name, and asked for "patient Morrison" (giving no other identifying information). The person answering the telephone (never identified) incorrectly stated that Ms. Morrison had been moved to the oncology floor, when she was, in fact, still on the telemetry floor.*

6:20 a.m. *RN_1 called the oncology floor, where Joan Morris had been transferred after her cerebral angiography. RN_1 was mistakenly informed that the patient she sought (Jane Morrison) was there, and she was told that the patient would be transported to the electrophysiology laboratory.*

6:30 a.m. *Joan Morris's nurse, RN_2 (who was nearing the end of her shift), agreed to transport the patient for the electrophysiology procedure, although neither the charge nurse nor Ms. Morris's nurse from the previous evening had told her of a plan for an electrophysiology procedure. RN_2 assumed that the study had been arranged despite the absence of a written order for it in the chart. Ms. Morris stated that she was unaware of plans for an electrophysiology procedure, she did not want to undergo it, and she was nauseated. RN_2 informed the patient that she could refuse the procedure after she arrived in the electrophysiology laboratory.*

6:45 a.m. *RN_2 brought Ms. Morris to the electrophysiology laboratory, along with her chart. After the patient again expressed reluctance to undergo the procedure, the electrophysiology nurse, RN_1, paged the electrophysiology attending, who returned the page promptly. He asked to speak with the patient, who again stated that she was nauseated and felt generally unwell. The attending had briefly met Jane Morrison (the correct patient) the night before but did not realize he was now speaking with a different patient. He was somewhat surprised to hear of her reluctance to undergo the procedure because she had not expressed this concern the night before. After speaking with Ms. Morris, he instructed RN_1 to administer intravenous prochlorperazine for nausea and stated that the patient had agreed to proceed.*

6:45 to 7:00 a.m. *RN_1 reviewed the chart accompanying the patient and noticed no consent form, even though the daily schedule stated that consent had been obtained. She paged the electrophysiology fellow scheduled to do the procedure.*

7:00 to 7:15 a.m. *Upon arrival, the fellow reviewed the chart and was surprised at its relative lack of pertinent information. However, the fellow then discussed the procedure with the patient and had her sign the consent for "EP Study with possible ICD and possible PM placement" (EP = electrophysiology; ICD = implantable cardiac defibrillator; PM = pacemaker). A per diem nurse in the electrophysiology laboratory, RN_3, witnessed the consent. Prochlorperazine was given after Ms. Morris signed the consent form.*

UNINFORMED CONSENT

How could Ms. Morris, a native English speaker and a high school graduate, have signed a consent form for a procedure she knew she was not supposed to undergo—a consent form that indicated her agreement to possible cardiac surgery to implant a defibrillator? In theory, the process of informed consent should protect both patients and caregivers from adverse events such as this by providing patients the information they need to become full participants in decisions about their care. In practice, however, the process of obtaining informed consent is often deeply flawed. Obtaining consent is frequently delegated to an overburdened or exhausted physician who has not met the patient previously and does not know the details of the medical history. Cultural or social barriers to effective communication may be neither appreciated nor overcome. Although expected benefits and risks may be briefly described, truly involving the patient in the decision-making process is often not a top priority (15). Patients frequently cannot recall crucial information about procedures within hours of giving consent (16–18). In two studies conducted more than a decade apart, more than 60% of patients surveyed about their experiences with the consent process said they believed that consent forms are intended to protect physicians' rights (19, 20).

So why did Ms. Morris sign the consent form? Could she have thought she was agreeing to the surgery to repair the second aneurysm that had been planned for a subsequent hospital stay? Perhaps. But if the electrophysiology fellow had thoroughly explained the electrophysiology study, it is difficult to imagine that the patient would have confused the two procedures. Ms. Morris did sign the form, but she clearly did not give "informed consent."

CHRONOLOGY OF EVENTS, CONTINUED

7:10 a.m. The electrophysiology charge nurse arrived and was told by RN_1 that a patient scheduled for an early start had arrived. No patient name was used in this conversation. The charge nurse checked the electrophysiology schedule and then left to attend to other duties.

7:15 to 7:30 a.m. RN_3 placed the patient on the table, attached monitors, and spoke to the patient about her procedure. Ms. Morris stated that she had "fainted," which seemed to RN_3 to be a reasonable indication for an electrophysiology procedure.

7:30 a.m. A resident from the neurosurgery team on his morning rounds was surprised to find Ms. Morris out of her room. After learning of the electrophysiology procedure, he came down to the electrophysiology laboratory and demanded to know "why my patient" [not using her name] was there, as he was unaware of an order for this procedure. RN_1 informed the resident that the patient had been bumped twice already but was now being taken as the first case of the day. The resident left the electrophysiology laboratory assuming that his attending had ordered the study without telling him.

8:00 a.m. An additional electrophysiology nurse (RN_4) and the electrophysiology attending arrived. The attending stood outside the procedure room at the computer console and could not see the patient's face because her head was draped. The fellow initiated the procedure, inserting femoral sheaths and beginning programmed stimulation of the heart via an intracardiac electrophysiology catheter.

8:30 to 8:45 a.m. A nurse from the telemetry floor, RN_5, telephoned the electrophysiology laboratory to find out why no one had called for Jane Morrison (the correct patient). RN_3 took the call and, after consulting with RN_4 about the expected completion time for the current case (Joan Morris), advised RN_5 to send Ms. Morrison down at 10 a.m.

8:30 to 8:45 a.m. The electrophysiology charge nurse, making patient stickers for the morning cases, noticed that "Joan Morris" did not match any of the five names listed in the morning log. Entering the electrophysiology laboratory, she questioned the fellow about the patient names. He said, "This is our patient." Because the procedure was at a technically demanding juncture, the charge nurse did not pursue the conversation further, assuming that Ms. Morris had been added after the advance schedule had been distributed.

9:00 to 9:15 a.m. Like the neurosurgery resident 90 minutes earlier, an interventional radiology attending went to Ms. Morris's room and was surprised to find it empty. He called the electrophysiology laboratory to ask why Ms. Morris was undergoing this procedure. The electrophysiology attending stated to the nurse that the call concerned a patient named Morris, but that Jane Morrison was on the table. The electrophysiology charge nurse corrected him, stating that, in fact, Joan Morris was on the table. The electrophysiology attending asked to see the patient's chart and recognized the error.

9:15 to 9:30 a.m. The study was aborted, and the patient was returned to the oncology floor in stable condition. The electrophysiology attending explained the error to the patient and her family. The patient stayed in the hospital overnight for observation and was discharged the next day. She was scheduled for outpatient neurosurgical follow-up to arrange surgery for her remaining aneurysm.

Disclosing Errors

To begin at the end, one of the many features of this case that deserves emphasis is the commendably immediate and complete disclosure of the error. We must overcome any temptation to be less than fully candid. The ethical imperative to inform patients and families when errors lead to adverse events overwhelms all other considerations.

The Roles of Individuals and Systems in Causing This Adverse Event

On first reading, one may be tempted to blame this adverse event on any one of several individuals, from the nurse who mistakenly brought Joan Morris to the electrophysiology laboratory (RN_2) to the electrophysiology attending physician who failed to introduce himself to the patient at the start of the procedure. A closer analysis reveals problems beyond individual errors. To be sure, individuals made errors. In fact, discrete errors occurred in at least 17 different places. (See **Appendix Table 1**, available at www.annals.org.) But this event shares many characteristics with other well-known and exhaustively researched calamities, such as the Challenger disaster, the Chernobyl nuclear reactor explosion, and the Bhopal chemical factory catastrophe. These events have been termed "organizational accidents" by psychologist and accident expert James Reason because they happen to complex, modern organizations, not to individuals (21, 22). No single individual error is sufficiently grave to cause an organizational accident. The errors of many individuals ("active errors") converge and interact with system weaknesses ("latent conditions"), increasing the likelihood that individual errors will do harm.

Understanding why Ms. Morris mistakenly underwent the electrophysiology procedure requires looking beyond the actions of individuals to factors affecting the functioning of the systems in which the individuals acted. It is important to distinguish between two groups of these factors. *Environmental factors* are not readily changeable, at least in the short run, and thus they form the fixed context in which systems and people function. They act on all hospitals to increase the likelihood of this kind of adverse event. *Latent conditions* are system faults that can be remedied and act within individual hospitals to increase the probability that individuals will make errors, that errors will do harm, or both.

A disease analogy may clarify some of these relationships. Environmental factors are analogous to the genetic predispositions of an individual to develop atherosclerotic heart disease and its harmful sequelae. At present, these predispositions cannot be altered. Latent conditions resemble abnormalities such as hypertension or hypercholesterolemia. Like environmental factors, they can lurk unobserved for years, until the atherosclerotic plaque they promoted ruptures and causes a myocardial infarction. Unlike environmental factors, latent conditions can be effectively treated, reducing their capacity for harm.

Some of the most important environmental factors pertinent to this case are the increasing subspecialization in medicine (particularly in disciplines in which invasive procedures are an important part of practice), ongoing pressures to reduce hospital staffs, the trend to perform invasive procedures in hospitals on a short-stay basis, and the unremitting efforts of hospitals to reduce lengths of stay. These forces act on all hospitals to reduce the likelihood that an individual patient will be surrounded by physicians and nurses who know her well, understand why she is hospitalized, and actively coordinate planned tests and treatments. They act synergistically to increase the probability that the wrong patient will undergo an invasive procedure.

Communication, Teamwork, and the Culture of Low Expectations

The most important latent conditions in this case include failures of communication, teamwork, and identity verification. Perhaps the most striking feature of this case—one that will be familiar to all clinicians who have worked in large hospitals—is the frighteningly poor communication it exemplifies. Physicians failed to communicate with nurses, attendings failed to communicate with residents and fellows, staff from one unit failed to communicate with those from others, and no one lis-

tened carefully to the patient. Although no data exist to document how widespread communication failures are, they are probably endemic in large, complex academic medical centers (23–30).

Poorly functioning teams are also a feature of this case. In addition to communicating well, effective teams allocate role responsibilities clearly, train to back up team members as necessary, monitor team members' performance, resolve conflicts efficiently, and use well-designed protocols and procedures to assure that complex tasks are executed flawlessly (31). Here, the oncology floor team failed in its responsibility to assure that Joan Morris received the care intended for her, and the electrophysiology laboratory team failed to keep track of whom they were treating and why.

How could so many well-trained and well-intentioned health care professionals ignore so many seemingly clear signals that they were subjecting the wrong patient to an invasive procedure? We recognize that retrospective root-cause analyses are susceptible to hindsight bias and may overestimate what it was reasonable for participants to know or anticipate in foresight (21). Nevertheless, we suspect that these physicians and nurses had become accustomed to poor communication and teamwork. A "culture of low expectations" developed, in which participants came to expect a norm of faulty and incomplete exchange of information. Nurses had probably observed many instances of patients' lacking information about planned procedures; RN_2 may have regarded Joan Morris's objections as just another such example. Similarly, residents may have grown accustomed to being unaware of all the tests or treatments ordered by attendings, and physicians may have often failed to fully inform nurses about treatment plans. The combined impact of these experiences probably led these conscientious professionals to discount the numerous warning signals present in this case. The culture of low expectations led each of them to conclude that these red flags signified not unusual, worrisome harbingers but rather mundane repetitions of the poor communication to which they had become inured.

What role did the similarity of the patients' names play in causing this adverse event? Patients with similar names present challenges to the best-functioning health care systems. In this case, the similar-sounding names led to errors that exposed long-standing system weaknesses that failed to prevent harm.

One of the most important defenses against this kind of adverse event was absent: a standardized protocol to verify patient identity (32). Despite the communication and teamwork failures, the adverse event could have been prevented at several different times if such a protocol had been in place and adhered to by either the electrophysiology laboratory or the oncology floor. Some automated verification systems (for example, barcoding technology) may help to reduce the likelihood of misidentifications. But the technology still requires a protocol to be effective. A particular team member must be charged with matching the bar code on the patient's identity bracelet to the bar code on the medication, blood product, or invasive procedure schedule.

Furthermore, this hospital suffers from an information system disease that we suspect is common to many large academic medical centers: a patchwork of homegrown information minisystems, few of which interact effectively with each other. Because the electrophysiology laboratory's computer system could not connect to other hospital systems, it could not use their data to verify patient identities.

Finally, if Ms. Morris's medical record had contained legible and clear information about why she was in the hospital and what treatments were planned, one of her caregivers might have recognized the misidentification and averted this adverse event. The increasing frequency with which invasive procedures are performed during brief hospital stays encourages less documentation in the patient's medical record. Caregivers may thus expect little pertinent clinical information to appear in these patients' charts and not consider its absence worrisome.

Although these environmental factors and latent conditions were crucial in setting the stage for this event, individual factors undoubtedly also increased the likelihood of errors. We do not know all of the stressors that were operating on each of the individuals in this case, but a few common ones may have been involved. RN_2 was at the end of her shift on the oncology floor; she may have been in a hurry to leave and perhaps was less attentive to apparent warning signals than she would have otherwise been. Were other staff affected by this factor or by fatigue? Was the neurosurgery resident or electrophysiology fellow exhausted after a night on call (33–35)?

Factors that increase the likelihood of individuals

making errors can never be completely eliminated. Human performance can be improved but not perfected. Industries that have reduced serious errors to extremely low levels have done so not by perfecting human performance but rather by improving the performance characteristics of the systems in which the humans work (22, 36, 37). Thus, the inevitable human errors are intercepted and prevented from doing harm. As Reason concludes, "We cannot change the human condition, but we can change the conditions under which people work" (21).

How Can We Avoid These Errors?

First, everyone practicing in complex delivery system settings should recognize that performing an invasive procedure on the wrong patient is an all-too-real possibility. No large hospital is immune from the individual errors or latent conditions present in this case. Yet, it appears that Joan Morris's caregivers did not conceive that it was possible that they had the wrong patient. As clinical teachers, we impress on trainees the importance of considering the most obscure diagnoses in evaluating individual patients. Similarly, we need to raise our index of suspicion for the possibility that patients are undergoing invasive procedures not intended for them.

Furthermore, we believe that open and vigorous discussion is a prerequisite for robust solutions. We were disappointed but not surprised that we could not find a single article in the literature discussing this problem. Given the environmental influences that are probably increasing the likelihood of these events, we must combat the clinical tunnel vision that subspecialization encourages. Nursing staffs should take particular care to familiarize themselves with short-stay patients and their treatment plans. No patient should leave a hospital floor for a procedure without a signed order and a fully executed consent form in the medical record. Hospitals should develop specific protocols for communicating vital clinical information when patients must spend time on inpatient units unfamiliar with their conditions. All units in which invasive procedures are performed must develop and adhere to routine, standardized procedures for verifying patient identity.

We believe that the communication and teamwork failures so prominent in this case are commonplace and lie at the root of many preventable adverse outcomes in health care delivery. Remedying such failures is at once our greatest challenge and our best hope for improvement. We should, however, resist the temptation to use punishment as an instrument of improvement in this case. No single error caused this adverse event; there is no reason to expect that punishing individuals would reduce the likelihood of recurrence.

Little research has addressed the relationship between communication or coordination of care and patient outcomes (38–40). We found no proven, effective interventions to improve communication and teamwork in health care delivery. However, a model for us to emulate does exist. When the National Aeronautics and Space Administration carefully studied the causes of airplane crashes in the 1970s, it concluded that 70% involved human error rather than irremediable mechanical failure. The most common errors related to failed communication and teamwork (41). These findings led to the development of a comprehensive set of training programs known as Crew Resource Management (CRM), which has now been implemented by the U.S. Federal Aviation Administration for all commercial airlines. These programs teach crews how to avoid barriers to effective communication and how to function well as teams. Evaluation has shown their effectiveness (42).

Recent research conducted by one of the developers of CRM has begun to characterize patterns of poor communication and teamwork among surgical and intensive care unit teams (31, 43). In one study, researchers compared the responses of pilots and surgical teams about several factors important in managing errors. Pilots were much more likely to acknowledge the adverse effects of fatigue on their own performance (64%) than were surgeons (18%) and to agree that junior team members should be free to question decisions of their seniors (97% vs. 55%) (44). Applying CRM to medicine will require the development, testing, and evaluation of methods to train (and periodically retrain) health care workers to value effective communication and teamwork, break down communication barriers (for example, hierarchies within and between professions, boundaries between departments), and function effectively as team members (for example, by repetitive practice of error management strategies in simulated patient care scenarios).

In this case, Joan Morris was mistakenly subjected to an invasive procedure over her repeated objections.

Even though many individuals made errors, none was egregious or causative by itself. Instead, the systemic problems of poor communication, dysfunctional teams, and the absence of meticulously designed and implemented identity verification procedures permitted these errors to do harm. Just as we screen asymptomatic patients for hypertension, all health care systems should assess how well communication, teamwork, and protocols are functioning. Just as treating hypertension effectively prevents strokes, addressing underlying system flaws will greatly increase the likelihood that the inevitable errors of individuals will be intercepted and prevented from causing harm.

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Appendix tables, current author addresses, excerpts of patient and provider interviews, and excerpts of the question-and-answer session are available at www.annals.org.

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In the beginner's mind there are many possibilities; in the expert's mind there are few.

Shunryu Suzuki
Zen Mind, Beginner's Mind
New York: Weatherhill; 1991:21

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