The Patient's Guide to Preventing Medical Errors

Karin Janine Berntsen

PRAEGER

The Patient's Guide to Preventing Medical Errors

The Patient's Guide to Preventing Medical Errors

Karin Janine Berntsen

PRAEGER

Westport, Connecticut
London

Berntsen, Karin Janine.
The patient's guide to preventing medical errors / Karin Janine Berntsen.
p. cm.
Includes bibliographical references and index.
ISBN 0–275–98230–0 (alk. paper)
1. Medical errors—United States—Prevention. I. Title.
R729.8.B476 2004
610—dc22 2004040052

British Library Cataloguing in Publication Data is available.

Library of Congress Catalog Card Number: 2004040052
ISBN: 0–275–98230–0

First published in 2004

Praeger Publishers, 88 Post Road West, Westport, CT 06881
An imprint of Greenwood Publishing Group, Inc.
www.praeger.com

Printed in the United States of America

The paper used in this book complies with the Permanent Paper Standard issued by the National Information Standards Organization (Z39.48–1984).

10 9 8 7 6 5 4 3 2 1

Tips and Information in: *The Patient's Guide to Preventing Medical Errors*

A warning: The information in this book is NOT intended as medical advice. These tips are intended *only* to be helpful and used as a commonsense approach and guide to avoiding medical errors.

For any concerns, questions, uncertainties, medical advice, or unusual situations, contact your physician. For any emergency, call 911.

These tips are NOT intended to be all-inclusive with regard to the prevention of all medical or medication errors.

"Be strong . . . and work, for I am with you," says the Lord of Hosts.
Haggai 2:4

This book is dedicated to the memory of my dear mother, Janine,
and to my special husband, Alan, and my extraordinary son,
Jonathan.

Contents

Acknowledgments ix

Introduction xi

CHAPTER 1 The Error Factor 1

CHAPTER 2 Communication Vulnerabilities 27

CHAPTER 3 Why the Silence? 41

CHAPTER 4 Organized Structures within Hospitals 53

CHAPTER 5 Who Is Watching the Hospitals? 65

CHAPTER 6 Making Safer Health Care Choices: What the Numbers Mean 75

CHAPTER 7 Rapid Advancements in Medicine 91

CHAPTER 8 Old Designs, Prone to Errors: System Failures and Human Factors 103

CHAPTER 9 Disclosure 123

CHAPTER 10 Beyond Medical Malpractice 143

CHAPTER 11 Toward a New Safety Culture: How the Change Will Happen 159

CHAPTER 12 **The Patient Partnership: What Needs to Change** 177

CHAPTER 13 Hospitals on the Mend 203

CHAPTER 14 What You Can Do to Protect Yourself 213

Appendix 1: Be Safe: Preventing Medical Errors 233

Appendix 2: Resources 235

Appendix 3: Key to Pill Combinations 241

Notes 243

Select Bibliography 257

Index 259

Photo essay follows chapter 8.

Acknowledgments

I want to acknowledge the people, particularly the children, who have been harmed by medical errors. Hospitals were designed to heal, to help the infirm and sick recover and return to a healthy lifestyle. Great advancements in medicine have accomplished many wonders and have brought healing to countless people. Nevertheless, with no malicious intent, some hospitals have harmed rather than healed people.

By writing this book for the general public, I hope to lessen the chance that medical errors will occur. The stories I have shared about patients and their families or one of the tips provided here may encourage readers to be extra careful, stop, speak up, and ask questions, all good strategies that may help to identify circumstances that lead to errors. My hope is that this information alerts people everywhere to be more involved in their health care.

I thank those who have spoken up about their medical errors, those who were willing to share stories of their suffering so that other people might avoid a similar circumstance. Additionally, I acknowledge the health care professionals who are working hard for the cause of patient safety and who have been my colleagues and friends in this endeavor. I thank Willa Fields for first teaching me the principles of quality whereby all improvements, including patient safety, are made; Louise Balesteri for her dedicated support and literally being my right-hand person over the years; Michael Long, M.D., for his dedi-

cated support to the cause of quality; Annette Graham, whose intelligence in health care matters is unsurpassed; Wendy Kaler, who battles every day to prevent and control infectious diseases; Marcia Hall for her guidance and support over the years; Holly Heaton for her dedication to a fair and balanced approach to legal health care issues; Michele Tarbet for her support and leadership; Robert Pachorek for his promotion of medication safety; and Gerrie James, my friend and spiritual supporter, who said, "You can do this!"

In addition, I thank Michael, whose intelligence and past experience in receiving medical care helped to encourage me to persevere with this important endeavor.

And last, I acknowledge my many staff members over the years who have been diligent and faithful in helping to improve patient care every day.

Introduction

It is natural to feel apprehensive when facing a surgical procedure or entering a hospital to receive treatment for a newly diagnosed illness. Although a bit nervous, people assume that they will be safe. That assumption is wrong. A startling report revealed that it is far safer to fly on a commercial airliner than to be a patient in a hospital. In fact, receiving health care services is considered as dangerous as mountain climbing or bungee jumping.

The extensive report, "To Err Is Human: Building a Safer Health System," from the Institute of Medicine (IOM) in Washington, D.C., states that up to 98,000 people die each year as a result of medical errors in U.S. hospitals. This is equivalent to 268 fatalities a day, or the loss of a fully loaded 767 airliner. Numerous others suffer from injuries while hospitalized, ranging from minor falls to permanent disability. The IOM report reveals that over half of these deaths and injuries are preventable.[1]

Medical errors need to be significantly decreased. The "error factor" occurring in health care systems is complex, multifactorial, and challenging to solve. Faulty systems that lead to patient injury and death should be identified and new, safer systems designed. However, changes in these intricate systems will happen more effectively and rapidly only with the involvement of health care consumers. There is a need for a professional-public partnership to be forged in order to work together for solutions. If patients can learn about health care

system vulnerabilities, and, most importantly, if they can learn to be more involved in their care, then perhaps some medical errors may be avoided. As with other circumstances, knowledge is power; moreover, knowledge of vulnerable health care systems and the medical errors that take place within them may be the means to help save lives.

Debbie, for example, developed diabetes when she was 14 and required several injections of insulin each day. Recently she developed the flu and went to the emergency room with a slightly elevated blood sugar level. She normally administered her own insulin but was feeling too ill to do so. The nurse caring for Debbie came in with a syringe of insulin. The nurse placed the insulin syringe into Debbie's intravenous (IV) line port. Even though Debbie was feeling poorly, she glanced over at the syringe and screamed "Stop!" The doctor had written an order for 10 units of a fast-acting insulin, but the nurse was about to inject 100 units in error. The syringe markings were small and the nurse had misread them. This overdose of insulin would have killed Debbie within minutes of the injection. What prevented this error from having fatal consequences? Debbie was thoroughly knowledgeable about her diabetes and specifically the medication required to treat her illness. A less aware patient might not have been so fortunate.

Throughout a 25-year career in health care, I have witnessed many near misses and encountered serious medical errors as well. Most recently, as vice president of patient safety and quality improvement for a seven-hospital health care system in southern California, I reviewed significant medical errors from both preventive and medical-legal perspectives.

As a registered nurse and former paramedic specializing in trauma, emergency medicine, and cardiac care, which included other roles as emergency cardiac coordinator, telemetry unit manager, state nurse educator, and nursing director, I recognize that health care services are fragmented and prone to error. I was moved by "To Err Is Human" and am relieved that an official report substantiates my observation—that too many people are being harmed by preventable medical errors.

The IOM report quickly moved hospital leaders into action—participating in national conferences, creating patient safety plans, collecting data, and implementing patient safety projects. All of these initiatives are steps in the right direction. Clearly, health care leaders have developed the passion needed to change the equation of harm.

Yet, as I lead hospital safety committees, coordinate patient safety seminars, teach on the reduction of medical errors and research best

practices—which were all designed to reduce medical errors—I consistently note that patients are not at the core of this new culture change. I have been troubled by the fact that hospital professionals are failing to work with the public to design safer systems. I also recognized that strategies to involve consumers are complex. How do we ask patients about medical error prevention without frightening them? How do we collect and incorporate consumer ideas into safety planning when consumers do not understand the intricacies of complicated health systems? Will soliciting public involvement slow the progress that we as professionals need to accomplish?

These questions led me to review the literature on safety resources available to the public. I found a myriad of information on reducing medical errors designed for professionals, but very little targeted for the consumer. Moreover, there was little material that focused on formulating error-prevention partnerships with the public.

In writing this book, I hope to inform consumers about the problem of medical errors and begin to forge the *partnership of change.* I selected real stories based on illustrations of health care system vulnerabilities as opposed to those that target individual blame. Even though numerous other stories could be shared, these illustrations reveal the complexity of interactions that are built into health care systems and allow for medical errors.

The situations described in these accounts have occurred and continue to occur in U.S. hospitals. Some of the stories in this book use the patients' actual names, because they have been willing to publish their experiences. Other names, times, and places have been changed to protect patient identities. Some events occur repeatedly within hospitals, and key factors of several cases have been combined to illustrate common hospital system breakdowns.

This book focuses primarily on the hospital experience, with some examples of outpatient settings and doctors' offices included to help illustrate health care system vulnerabilities. Additional research is warranted on the outpatient setting, physicians' offices, and long-term-care facilities, given that the problem of medical errors is not isolated to hospitals.

Although I have chosen to write about the vulnerability of health care systems, I do not address the complex problem of the nursing shortage. This problem alone warrants an exploration of the many issues surrounding this critical situation as well as potential solutions. The nursing shortage has no doubt had an impact on system breakdowns; however, this book is written to address the broader

problem of failed health care systems and to move the consumer to action.

With all this in mind, the consumer needs to demand changes in health care. Since the IOM report, there has been little consumer pressure on legislative bodies to reduce medical errors and improve health care systems. This may be due in part to the fact that consumers do not have ongoing, relevant information on medical errors. The public knows there is a problem, yet the means to help people take steps toward error reduction is lacking. Almost without exception, each person I have told that I was researching and writing this book described to me a friend or family member who had a medical mishap. Even with these experiences, people felt a lack of empowerment to change fragmented health care systems.

Until safer systems are designed, patients and families must take a leading role in driving what happens to them while they are receiving health care services. Patients should move away from blind trust and begin speaking up and avoiding assumptions of safety. Often people feel intimidated or rushed when they have questions for clinicians. Other times people feel they are at the disposal of a surgeon or specialist and are careful not to "make the doctor mad" because they have to receive ongoing treatment from that practitioner. Ultimately, this culture needs to shift into a patient-centered model. This book is written as a guide to help consumers make this shift by giving them information so they feel more confident and less intimidated in speaking up about their concerns.

Last, and just as significant, the book provides practical resources in the form of consumer tips and information on referral organizations. By using these resources, the public can gain the knowledge needed to maneuver through the complex medical system and possibly to prevent errors from occurring.

CHAPTER 1

The Error Factor

JESICA

On February 7, 2003, Jesica Santillán was scheduled for a heart-lung transplant. Jesica was looking forward to receiving her new heart and lung. The thought of feeling better, not having fainting spells, and having more energy excited her.

The doctors assured the Santilláns that Jesica was an excellent candidate for the transplant. Jesica was 17 and had her whole life to look forward to. She had been born with a heart defect and was small for her age, only 90 pounds. This transplant was a chance for a new beginning. After all, Duke University Hospital was one of the leading hospitals in the country. A few years earlier, the Santilláns had come from Mexico to the United States in order to receive the best care for Jesica.

Jesica Santillán

After surgery, when Jesica was removed from the heart bypass machine, something began to go terribly wrong. Jesica's vital signs were not responding the way they should have been, and the operating room team had to put her back on cardiac bypass. The new organs were not functioning. Shortly after the OR team realized that Jesica was in trouble, a call came from the laboratory. Jesica's blood was incompatible with that of her new heart and lung. Jesica had O positive blood and the

Table 1.1
How Safe Is Health Care?

Less than 1 death per 100,000 encounters
Nuclear power
European railroads
Scheduled airline flights
One death in less than 100,000 but more than 1,000 encounters
Driving
Chemical manufacturing
More than 1 death per 1,000 encounters
Bungee jumping
Mountain climbing
Health care

Source: Richard Smith (ed.). (2001). *British Medical Journal.*

organ donor was type A. This combination causes the most severe form of a blood reaction.

Although an attempt was made to reverse the blood reaction and Jesica was given a new heart and lung, it was too late. By February 21, 2003, the doctors realized that Jesica had irreversible brain damage. Jesica died on February 22, 2003.

What Went Wrong?

Jesica died as a result of a hemolytic blood reaction. The official autopsy report stated, "Given the historical circumstances and the autopsy findings, it is my opinion that this young woman's death was the result of global cerebral hypoxic injury that was a complication of the rejection of an . . . incompatible heart-lung transplant." The report was signed by Dr. John Butts, the chief state medical examiner in North Carolina.[1]

Hemolytic reactions are rare. When they do occur they are very serious and can be fatal. This reaction is also known as ABO incom-

patibility. Jesica's blood, type O, had no ability to handle blood cells with type A antigens. Antibodies within her blood plasma would attack either a type A or a type B donor's blood cells.

Often a hemolytic reaction can lead to a condition known as disseminated intravascular coagulation (DIC). DIC is a problematic and complex condition that starts with microscopic bleeding and eventually leads to an overreaction of the body's blood clotting system. Tiny blood clots develop throughout the body and ultimately lead to lack of oxygen for vital organs, including the brain (as occurred with Jesica). Kidney failure, heart failure, and death ensue.

Because a surgeon is technically in charge of the surgical case, Dr. James Jaggers, Jesica's transplant surgeon, assumed accountability for the organ mix-up. Conversely, he is not fully responsible for it. No one person, no human error alone is to blame. The medical error that took Jesica's life was the result of system design failures.

Just after the error occurred, Duke University Hospital released the following letter. This letter helps to identify the components of the "error factor" and illustrates the complex methods and multiple steps involved in most health care processes that allow for medical errors to occur.

From: Duke University Hospital
February 21, 2003
To: United Network for Organ Sharing (UNOS)

Dear ___:

Duke University Hospital has completed the initial phase review of the events related to the heart/lung transplant from donor ___. We provide the following to promote our joint efforts in the peer review of this incident and for the purpose of performance improvement.

We have concluded that human error occurred at several points in the organ placement process that had no structured redundancy. The critical failure was absence of positive confirmation of ABO compatibility of the donor organs and the identified recipient patient. The transplant surgeon does not recall receiving or requesting information regarding the donor's ABO type from the procurement coordinator, who released the organs for the specific recipient.

Jesica Santillán . . . was then listed for heart/lung transplantation in May 2002.

An offer from Carolina Donor Services (CDS) of organs was made in the evening on 2/6/03. The organs were offered to Dr. A.,

the adult heart transplant surgeon on call, for a pediatric heart transplant recipient. Because the potential recipient was a pediatric patient, Dr. A. referred CDS to Dr. B., the pediatric heart transplant surgeon on call.

Dr. B. declined for the specified patient because that patient was not ready for transplant. Dr. B. inquired about heart/lung availability for Jesica Santillán, specifying the patient by name. Dr. B. inquired about the status of the lungs. The organ procurement coordinator stated that he would check this and call back.

On the return call, Dr. C., the lung and heart/lung adult transplant surgeon on call, then was offered a heart/lung block from this donor for an adult recipient. He declined due to size incompatibility. The organs were then offered by CDS to Dr. B. for Jesica Santillán.

Dr. B. accepted the offer. He does not recall ABO typing being discussed with CDS but does recall a discussion of height, weight, and cause of death. Arrangements were made for Jesica Santillán to be admitted to the Pediatric ICU and for the harvest team to travel to the donor site to retrieve the organs.

On arrival at the donor site, the harvesting physician, Dr. D., examined the organs of the donor and reviewed the donor packet. Dr. D. judged the organs to be of good quality. He called Dr. B. and reported the condition of the organs and was directed to harvest the heart and lungs. The organs were transported back to Duke University Hospital following a delay due to bad weather.

Once the organs arrived at the Duke University Hospital operating room No. 7, the recipient's heart and lungs were removed and the donor organs were implanted . . .

. . . The organs functioned well for approximately 30–40 minutes after she was removed from bypass. Then the organ function deteriorated, and the patient was placed back on cardiopulmonary bypass.

Moments later, the OR received a call from the Duke University Hospital Clinical Transplant Immunology Laboratory reporting the transplant was ABO incompatible with the recipient . . .

. . . In response, Duke University Hospital has conducted a thorough root cause analysis of the event and the organ procurement process followed in the pediatric thoracic transplant program. During that review, the lack of redundancy was recognized as a weakness. Validation of the ABO compatibility and other key data elements regarding the donor and recipient will now be performed by:

- the transplant surgeon
- the transplant coordinator, and
- the procuring surgeon.

The transplant surgeon will actively confirm the donor and recipient key data elements verbally.

During the notification call to the transplant surgeon, the donor key data elements will be communicated. These data elements will be compared to the information in the transplant program's database to confirm blood type compatibility, size compatibility and if there are issues regarding anti-HLA antibodies.

An additional verification will be accomplished via telephone contact with the organ procurement organization placement coordinator by the transplant coordinator. The procuring surgeon will receive information including, but not limited to the ABO type and size about the intended recipient.

In the review of the donor packet, the procuring surgeon will verify the ABO compatibility as well as other key elements used to evaluate the suitability of the donor and the organs for the targeted recipient.

In addition, the procuring surgeon will complete a verbal verification of the ABO compatibility with the transplant surgeon. This call will be placed, as per current standard, prior to the organ procurement.

The verification processes outlined above were effectively implemented during the re-transplant of the recipient of [second] donor's ___ organs on February 20, 2003.

In addition to the redundant validation put in place, Duke University Hospital is evaluating the information technology supporting access to recipient information. Should that evaluation reveal a need for additional support, resources will be dedicated to meet those needs. We will continue to examine the organ procurement process for opportunities for additional safeguards. We will monitor the effectiveness of the process changes through our performance improvement program.

We believe that the changes we have put in place enhance the safety of the procurement process and should be considered as a national guideline.

Should you require additional information please do not hesitate to contact us.

Sincerely,

_____[2]

Events such as these happen in U.S. hospitals too frequently. It is clear in this multistep process, with the health care system's reliance on memory, lack of protocols, many hand-offs, and lack of technology support, that there are numerous opportunities for mistakes to occur.

Tragically, as this story plays out, the system failures that resulted in Jesica's death are not unusual. Several other case examples will be discussed throughout this book to specifically illustrate the type of system failures that commonly occur in health care.

What Are the Facts?

The Institute of Medicine (IOM), founded in 1970 through the National Academy of Sciences (an organization established by Congress), published an extensive report in 1999, "To Err Is Human: Building a Safer Health System."[3] The IOM report states that between 44,000 and 98,000 Americans die each year as a result of medical errors, accelerating the death rate above that of motor vehicle accidents (43,358), breast cancer (42,297), and AIDS (16,516). This report reveals that 3.7 percent of hospital patients end up with a disabling injury inflicted by medical care from an adverse event. The report further outlines that between 6.6 and 13.6 percent of adverse events occurring to patients result in death. Astoundingly, half of the deaths are preventable.

The IOM report lists various types of errors that occur within hospitals. These include transfusion errors, adverse drug events, wrong site or side surgery, surgical injuries, hospital-acquired infections, falls, burns, restraint-related injuries, and fractures.[4]

Tips

When you are receiving health care services, *you* can be the most important factor in preventing an error from affecting you.

Beware that errors can occur in any hospital or health care setting.

The Harvard Study

To establish the conclusions regarding errors, the IOM reviewed results from the Harvard Medical Practice Study, which looked at more than 30,000 randomly selected patient discharges from 51 hospitals in New York State. The study's findings were projected over the 33.6 million admissions to United States hospitals during 1997.[5] In combination with the Harvard study, the IOM reviewed over 15,000 patient records from Colorado and Utah. This research examined errors that occurred inside and outside of hospitals and found that four out of five errors happened while the patient was in the hospital. In fact, the hospital setting is prone to the highest number of errors.

Nevertheless, the consumer should not ignore the fact that significant errors can occur in physicians' offices and other nonhospital settings, such as clinics, outpatient centers, and nursing homes. The number of studies done in outpatient settings, however, is limited and needs further research. In addition to these two large studies, the IOM also reviewed 30 other studies on medical errors, which were also a basis of its conclusions regarding deaths from medical errors.[6]

Tips on Blood Products

Most blood that is administered comes in the form of blood products, such as packed (concentrated) red blood cells (RBCs), or other components of whole blood, such as plasma. These products use the part of the whole blood that will benefit the patient the most. Whole blood can be overwhelming for the body to assimilate and it is rarely transfused, except for special illnesses. Ask, "Am I receiving red blood cells, plasma, or other parts of blood?" Be sure you understand the kind of blood or blood products you will be receiving.

The risk for an acute hemolytic transfusion reaction (AHTR) is 1:25,000 with the risk of a fatal reaction at 1:160,000.[7]

When receiving blood or blood products, have a thorough discussion with your doctor about the reason you are receiving blood, including the results of any blood tests that are guiding the doctor to make the decision for you to receive them.

If you receive blood or blood products, you should know your own blood type—A, B, AB, or O—as well as whether your blood is Rh positive or Rh negative (Rh factor). Ensure that you or a family member confirms that the blood you receive is the same blood type as your own.

When signing your consent for surgery, read it thoroughly to see if it includes a clause regarding consent for blood administration. Some hospitals combine these consents, and you should be aware that you might receive blood if needed.

BEN KOLB

A Case of Death by Medication Error

In December 1995 at a Florida hospital, Ben Kolb, age seven, was scheduled for elective ear surgery at Martin Memorial Hospital. Ben had a history of ear problems and had already undergone two successful ear surgeries, one

Ben Kolb

when he was two years old and one when he was five. This surgery was expected to be another routine procedure.

It was two weeks before Christmas. Tammy and Tim, Ben's parents, were looking forward to the holidays. Tim was very proud of his son and enjoyed coaching Ben's soccer team. Ben, a natural-born leader, was the team's captain.

Ben was taken to surgery.

After Ben was taken to the operating room, the surgeon's first step was to administer lidocaine to numb the surgical area around Ben's ear. The syringe that the surgeon believed contained lidocaine, however, was filled instead with epinephrine. Within seconds of the injection, Ben's heart rate soared, and he went into cardiac arrest. Even though the operating room team worked for two hours to revive Ben, he slipped into a coma and died within 24 hours of the injection.[8]

Across the United States, all hospitals are fundamentally designed the same; hence errors that occur at one hospital can be common to all hospitals. Health systems are complex, with many forms of communication. The workflow occurs in such a way that many duties are handed off and interchanged among doctors, nurses, and other members of the health care team. These handoffs increase the chance of errors occurring.

How did two completely different drugs that create such opposite effects become mixed up during surgery? A later investigation of what went wrong in Ben Kolb's case revealed vulnerabilities in the system design of the operating room processes. Design flaws consisted of multiple latent (hidden) conditions that were present in the process for a number of years, setting up the system for failure and leading to Ben's death.

A nurse in the operating room on the day of Ben's surgery removed two medications from their original containers and placed the drugs in two separate cups. Routinely, lidocaine, which is injected to numb an area, was always placed in a metal cup and epinephrine (adrenaline), which is intended only for use on top of the skin, was placed in a plastic cup. The cups were then placed next to each other on an operating room table. This procedure had been carried out hundreds of times before in the Martin Memorial Hospital operating rooms and thousands of times more in operating rooms across the United States.

In Ben's case, a different nurse took a syringe and drew up the medicine from the metal cup that she thought contained lidocaine. Unknown to this nurse, the epinephrine had accidentally been placed in the metal cup. Both medicines are clear liquids that are indistinguishable from each other. The surgeon, who thought he had the lidocaine, injected the epinephrine surrounding Ben's ear. Epinephrine injected in this concentration causes a massive reaction and overstimulation of the body's vital organs—conditions that led to Ben's death.

Processing the medications in this manner was a faulty system design fraught with hidden conditions. It was only a matter of time until something went wrong. Tragically, this time the Kolb family paid the price. Broken processes and systems such as this exist too frequently in U.S. hospitals.

After the devastating error, Martin Memorial Hospital overhauled its operating room process. The leaders put in double and triple checks so that this error could not recur. Nonetheless, there was no mandate, regulation, or guarantee that the medical error with Ben Kolb's case had to be widely shared with other hospitals. Therefore, this same error could still occur today.

Injury from Adverse Events

The number of people who die as a result of adverse events is certainly alarming; additionally, injuries and disability from medical errors is a significant concern. In the Harvard study, 2.6 percent of adverse events resulted in permanent disability. The IOM reviewed another study that looked at 815 adverse events in patients from a university hospital. The study showed that of the 815 incidents, 9 percent were an iatrogenic illness that threatened life or resulted in a significant disability. Iatrogenic is a term that describes an event that results from a diagnostic procedure, a therapy, or a harmful event that was not part of the patient's condition. Another revealing fact from the IOM report showed that the chance of an adverse event occurring increased with each added day of hospitalization, an increased risk of 6 percent each day.[9] Hence, the longer a person is hospitalized, the greater his or her risk for a medical error.

The Impact of Errors

According to an article published in the *Journal of the American Medical Association* (Zahn & Miller, October 8, 2003), "Although medical injuries are recognized as a major hazard, little is known about their impact." To evaluate this impact the researchers looked at extra

days spent in the hospital, additional charges, and death rates from medical injuries. They concluded that costs resulting from injuries occurring during hospitalization ranged from no additional costs for obstetric trauma with minor repair to excess charges as high as $58,000 for serious infections occurring after an operation. Likewise, additional days spent in the hospital ranged from none for newborn trauma up to 11 days for operative infection. The researchers concluded that the impact of such injury is highly variable; however, injuries incurred during hospitalization pose a significant safety threat to patients and incur a large financial impact on society.[10]

Error Defined

The Institute of Medicine defines an error as "a failure of a planned action to be completed as intended or the use of the wrong plan to achieve an aim." The first term describes the error in Jesica's case. The IOM goes on to describe various types of errors, including errors of omission and errors of commission.[11] An error of omission is something that was supposed to happen but did not. An example of this would be a missed dosage of medication. An error of commission means a patient gets something that he or she was not supposed to receive. Jesica suffered from an error of commission; she received a heart and lung of an incompatible blood type.

If a patient needs a specific X-ray and the X-ray is performed on the wrong person, the person who misses the X-ray experiences an error of omission. The other patient experiences an error of commission because he or she undergoes a diagnostic test that was not intended for that person. Harm may not occur with either patient; however, if the person who does not get the X-ray has a small fracture or other key finding that is missed and goes untreated, then harm most likely will occur.

Tip

When undergoing any diagnostic test, ask what your test is for and why it is being done. Read the paperwork you are given to ensure that everything is correct. Speak up immediately if something seems questionable.

Error Reaching the Patient

The Institute of Medicine further defines[12] an active error as an error that occurs "at the level of the frontline operator and whose effects are felt almost immediately" and a latent error as an error

"in . . . design, organization, training, or maintenance that lead[s] to operator errors and whose effects typically *lie dormant* in the systems for lengthy periods of time."

Causes of medical errors are diverse, but fundamentally they are rooted in system breakdowns. James Reason has done extensive work on the occurrence of accidents in aviation, space travel, and the nuclear industry, including the Three Mile Island nuclear accident and the explosion of the space shuttle *Challenger*.

Reason explains, "Active [sharp end] failures are the unsafe acts committed by people who are in direct contact with the patient or system.[13] Latent conditions [latent errors] are the inherent processes that lead to sharp end errors; this is where root causes exist."

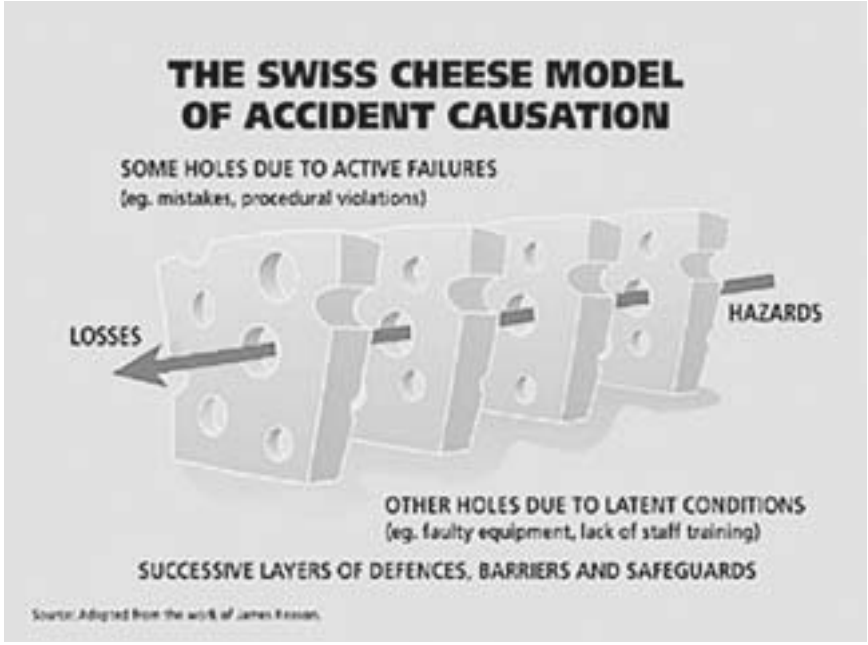
A simple way to understand this concept is to think of a flowing river. Some errors—latent ones—develop "upstream." The active error is the point of impact in the river where the damage is clearly visible. In Jesica's case, the active end of the error was that Jesica received organs with incompatible blood. The latent conditions were multiple and primarily were system communication failures between the organ donor center and the hospital. Latent errors are not clearly visible and are inherent in many processes. It is only a matter of time until all of the wrong processes collide and an active error occurs.

Another illustration that describes the sequence of latent errors is called the Swiss cheese effect.[14] Multiple layers of protection surround a patient. Most of these layers have flaws or holes, like the holes in Swiss cheese, that can be penetrated. Given the correct circumstances, diverse ways of performing the same tasks, and enough time, an error can travel through the imperfections in the barriers and reach the patient.

In Jesica's case, because the ABO compatibility confirmation process had worked successfully many times before, the health professionals involved could not see the latent conditions in the process until all the barriers were breached, resulting in the significant medical error. It is critical that the public understand the complex processes that can lead to conditions of harm. They can then be alert during the early stages of a process to question areas of concern.

Tip

Early in the process of receiving hospital or health care services, make note of any small item that is out of place, and correct it immediately. A small item that is out of place may ultimately be part of a latent condition that can lead to an error.



Swiss cheese effect. Medical errors travel through barriers and reach some patients. Illustration from James Reason.

Error Nomenclature

In health care, the nomenclature for defining medical errors is not standardized. The IOM has made the first attempt to clarify definitions. Standardization of error terminology will help the health care industry to better study errors, and this will help the public better understand the issues at hand.

The IOM defines an adverse event as "an injury caused by medical management, rather than the underlying condition of the patient."[15] An adverse event that is attributed to error is a preventable adverse event. The IOM found that 53 percent of adverse events are preventable.

Preventable or Not

One example of a preventable adverse event would be if a patient tells a hospital admitting clerk that he is allergic to penicillin, but the information never gets on the patient's chart. Following the patient's admission the doctor writes an order for a penicillin-related medicine. The nurse does not have the correct allergy information, nor does she check for allergies. The patient receives the penicillin-related medica-

tion and has a minor reaction. The health care team recognizes the reaction and quickly treats the patient. This reaction is an undesirable event and is a preventable adverse event because the health care professionals have an opportunity to catch the error before it reaches the patient.

In contrast, a nonpreventable adverse event occurs if a patient is not aware that he has an allergy to penicillin. Consequently, the patient tells the admitting clerk that he has no allergies. The penicillin-related medication is administered and the patient has a minor reaction. The health care team quickly treats the patient and no harm is done.

To keep preventable errors from reaching patients, the hospital should have a multisystem approach in place. It should improve its systems of communication, such as instituting a computer application that permanently records and transfers the patient's allergy status to any record that is used to treat the patient. For a simpler, less costly alternative, the hospital could use a special-colored wristband for patients with allergies. This would alert the nurse or clinician to the allergy before medications are administered.

Tip

Never assume that your doctor and other health care workers have communicated important facts about your care to each other. If you have an allergy to a medication, be sure that you repeat your allergy status to everyone giving you medicine.

LINDA

Unnecessary Radical Surgery Due to the Wrong Diagnosis

Linda McDougal, age 46, awoke from surgery with the anesthetic still lingering. She had been through a rough course. Two weeks earlier, Linda had been diagnosed with aggressive breast cancer. She and her husband made a harrowing, life-changing decision. Because she wanted to be around to see her three children grow up, she would undergo a bilateral mastectomy; removing both breasts was her best chance to beat the cancer and make a full recovery.

The next day, as Linda continued her postsurgical recovery, her surgeon came into her room and said, "I have bad news for you. You never had cancer." At first, Linda thought the surgeon meant that they got all the cancer during surgery and that would be good news. But when Linda asked her surgeon to clarify, she was told, "There was a mix-up in the lab."

Apparently, Linda's biopsy slides and paperwork were on the same tray as those of a patient with the aggressive cancer. The pathologist had mixed up the tests. Linda's breast tissue had been normal.[16]

How could such an error happen?

Given the Right Circumstances

Single errors such as those that Jesica, Ben, and Linda experienced appear to be isolated, but these errors are usually a combination of factors that converge into disaster. It would be easy to blame the nurses or doctors for these errors, but in each of these cases several dynamics collided that caused injury and death. If systems are not redesigned to be safer, then different doctors and nurses can still make similar errors today.

SHARON

Permanent Injury from Medication Error

In Minnesota, Sharon and James Williams were both established businesspeople and attorneys whose work took them traveling throughout Europe and Asia. Their marriage had produced two beautiful children.

Sharon had a history of painful uterine cysts and underwent surgery for a routine hysterectomy.

James said, "After surgery, when I saw her, I knew it was bad. She was jumping and twitching and her eyes were rolling all over the place." Sharon was in a coma. James later discovered that Sharon had been given an overdose of morphine in the recovery room after her surgery, and she stopped breathing. Sharon incurred irreversible brain damage and remains in a coma to this day.[17]

Medication Errors

Medical errors are significant, and a key subset of these errors involve medication errors, as evidenced by the cases of Ben Kolb and Sharon Williams discussed earlier. The IOM states that 7,000 people die each year as a result of medication errors and many more are harmed.[18] Hospitals use thousands of medications daily, many of which are beneficial and save lives. On the other hand, the administering of medications is a complex system, with many interacting