Chapter 5

Wrong Patient, Wrong Drug: An Unfortunate Confluence of Events

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Abstract

Older adults, aged 65 years or older, represent 14.9% of U.S. population, and are projected to increase to 22% by 2050. It is estimated that almost half of hospitalized patients are older adults and is expected to increase as the population ages. Hospitalized older adults are most vulnerable to adverse events because of aging-related conditions, physiological changes, and multiple comorbidities as well as fragmented care. The primary goal of health care providers is to improve patient safety and decrease adverse events. This chapter will use a complex clinical scenario with numerous potential overlapping risks to address the many active and latent factors that lead to patient safety-related adverse events. Factors involved, as well as preventive strategies, will be discussed in detail.

Keywords: patient safety, medication dosing, elderly, delirium prevention, falls, restraints, culture of safety, clinical informatics, same or similar name, handoffs, disclosing error

1. Introduction

Patient safety events are unfortunately a common occurrence in healthcare systems across the United States [1, 2]. Medication errors, hospital acquired infections, wrong site surgery, and other types of errors contribute to increased morbidity and mortality in hospitalized patients [3, 4]. The question, of course, is how do such errors occur and how can they be prevented? James Reason's 1990 book, "Human Error" created a conceptual framework, commonly known

as the Swiss Cheese Model to understand how such errors take place [5]. While not specifically aimed at healthcare, it instead seeks to explore how failures could occur in any system where holes in each defensive layer can lead to a potential for error. The availability of multiple defensive layers provide protection against a major hazardous event, but eventually, the holes line up and the system fails [5]. Some of the holes are related to active or proximal causes of failure–these are directly linked to how the patient, in the case of healthcare systems, is cared for. Other holes are due to latent causes that are hidden problems involving the entire health system. By dissecting a patient safety event into its active and latent causes, one can take a root-cause analysis approach to understanding, and ultimately preventing error [3]. In this chapter, we will investigate some of the active and latent causes that could have led to an error in the unfortunate clinical scenario outlined below.

2. Clinical vignette

The following is a hypothetical case used to illustrate several key patient safety issues: Mr. Timothy Pearse is an 85-year-old male admitted to the hospital for progressive symptoms of shortness of breath for the past 3 days. He has a past medical history of paroxysmal atrial fibrillation, coronary artery disease, systolic congestive heart failure, osteoarthritis of bilateral knees, and benign prostate hypertrophy. He has had three admissions in the past year for congestive heart failure exacerbations. His home medications include carvedilol, aspirin, furosemide, metolazone, atorvastatin, naproxen, and tamsulosin. Today, he is notably dyspneic and is experiencing oxygen desaturations to 87% on room air. His lung examination reveals bilateral crackles and he is in rapid atrial fibrillation with a rate of 144. He is given intravenous diuretics for his heart failure and beta-blockers for his atrial fibrillation and is admitted to the internal medicine service overnight.

The same night Mr. Thomas Pierce is admitted to the same internal medicine service with fever, confusion, and lethargy. Mr. Pierce is 87-years-old and has a history of Alzheimer's dementia, hypercholesterolemia, hypothyroidism, and neurogenic bladder from a prior back injury. He uses a chronic foley catheter. His initial workup is significant for sepsis secondary to pyelonephritis with acute delirium. He is started on empiric antibiotics and admitted to the hospital overnight.

Both patients are examined during rounds by the residents and attending physician at the bedside. Mr. Pearse had improvement in his atrial fibrillation and symptoms of heart failure but required further diuresis. Unfortunately, he developed acute renal failure from the combination of diuretics and naproxen. The decision was made to cautiously stop diuretics, stop naproxen, and to start intravenous heparin for his atrial fibrillation. The team next reviewed Mr. Pierce who was a few rooms down. Mr. Pierce received an "as needed" dose of lorazepam overnight for agitation and unfortunately experienced an unwitnessed fall in early morning hours, in addition to inadvertently pulling on his foley. This morning he was examined at the bedside where he was in soft hand restraints, with no improvement in his symptoms. His foley catheter had notable blood in the bag. His urine culture results were still pending, but

his fevers had not abated. The decision was made to avoid any further benzodiazepines and request a urology consultation for the hematuria. Antibiotics were not changed at this time, pending culture results which were expected to return within a few hours.

The team finished rounds on their patients and the residents dispersed to complete tasks and follow up on orders. One of the residents who was covering both Mr. Pearse and Mr. Pierce, had a clinic that afternoon and signed out to his co-resident prior to leaving the hospital for the day. While the covering resident was inputting the order for Mr. Pearse's heparin, he received a call from the nurse regarding culture results for Mr. Pierce. Mr. Pierce's urine culture revealed a resistant gram-negative bacterium. The resident discussed the finding with the infectious disease consultant who recommends a change in antibiotic including a dose of gentamycin for synergy. He also placed the orders and informed his attending of the changes.

A few hours later, the resident receives a phone call from the consulting urologist who is confused as to why heparin was ordered for a patient with active hematuria. Horrified, the resident realized that heparin had been ordered incorrectly for Mr. Pierce and gentamycin ordered incorrectly for Mr. Pearse. The resident immediately contacted nurses caring for both patients and is able to prevent the heparin from being started, but unfortunately, the gentamycin had already been administered. The resident and the attending return to Mr. Pearse's bedside to reassess him and then speak to him and his family about the medication error. Unfortunately, his renal failure worsens and his hospital stay becomes prolonged.

3. Active causes

As previously mentioned, causes of patient safety events can be understood easily when categorized by active vs. latent causes. The case above has several active causes that contributed to medical errors and ultimately to a patient safety adverse event. In the following section, we will explore the importance of appropriate medication dosing in the elderly, prevention and management of delirium in the elderly, fall prevention, and use of restraints in the hospital setting.

3.1. Appropriate medication dosing in the elderly

In the elderly, changes in pharmacodynamics and pharmacokinetics result in prolonged effects of medications, making them more prone to toxicity. For most medications, absorption is slower and peak serum concentrations may be lower and delayed [6–8]. On the other hand, metabolic clearance of drugs by the liver may be decreased due to reduced blood flow, size or mass, and changes in intrinsic pathways or reactions [6–8].

The kidneys play a vital role, as they excrete many drugs. With aging, there is a decrease in renal blood flow, kidney size, number of functioning nephrons, tubular secretion and estimated glomerular filtration rate (EGFR) [3–7]. In addition, due to decreased lean body mass, serum creatinine may stay in normal range, masking changes in creatinine clearance and renal function [3–8]. Estimating Creatinine clearance (CrCl) is often complicated in the

elderly due to such fluctuations, for example, the Cockroft–Gault calculation estimates EGFR based on weight, age, serum creatinine levels and gender; it requires, however, a stable serum creatinine level for accurate results [9]. This calculation may underestimate CrCl in those without significant age-related renal decline and may overestimate CrCl in those with renal mass reduction beyond normal aging [8].

Given the above, medication dosing in the elderly can be quite complicated! When prescribing medications in the elderly, the aim is to achieve a balance between over and under-prescribing. Some steps are outlined in **Table 1**.

It is important to note that the elderly are more prone to adverse drug effects and reactions including acute kidney injury, hypotension, delirium, and falls. Aging and illnesses which impair kidney function can lead to drug accumulation and toxicity. Additional risk factors include a CrCl less than 50 ml/min, multiple chronic medical comorbidities and polypharmacy [6–8]. It is important to decide on appropriate medication administration routes, medication forms and suitable times of administration to ensure effectiveness and compliance while minimizing adverse events. An additional tool is the American Geriatric Society's Beers Criteria, which identifies many common medications that cause adverse drug events in older adults and are meant to assist clinical judgment in prescribing medications for this population [10].

In summary, when prescribing in the elderly, it is essential to perform a complete medication review which should include all prescribed and over the counter drugs. Medications should be started at low doses and titrated upwards slowly. Therapeutic endpoints should be clearly defined and reviewed periodically. Close follow-up in this especially vulnerable population is essential.

3.2. Management of delirium in the elderly

Delirium is often multifactorial in origin and is caused by a sum of predisposing factors including advanced age, medical comorbidities, functional impairment and dementia; and precipitating factors which include acute medical problems, bed rest and the use of restraints [11]. Delirium is associated with substantial morbidity and mortality in older people and prevention is the best management. The Hospital Elder Life Program (HELP) is an innovative tool that uses tested delirium prevention strategies to improve the overall quality of hospital

1. Consider non-pharmacological methods for managing the condition in question if possible.
2. Review the benefits vs. risks associated with the medication. Is it truly appropriate?
3. Avoid starting more than one medication at any given time.
4. Consider using a single medication to address multiple conditions if possible.
5. Consider drug-drug interactions (including consideration of over the counter medications) and drug elimination (half-life and clearance) profiles of the medications prior to prescribing.
6. Periodically review medications and discontinue inappropriate medications as soon as possible.

Table 1. Recommendations for prescribing medications in the elderly [6, 8].

care in elderly patients [12]. This can be achieved by addressing predisposing factors such as using frequent reorientation, noise reduction, adequate hydration and early mobilization [11, 12]. In addition, identifying and treating reversible contributors such as pain, constipation, and drug withdrawal can assist in preventing the development of delirium. When delirium is present, early recognition and early non-pharmacological intervention along with patient and family support are very important [11, 12].

Pharmacological interventions can also be used in the treatment and management of acute delirium. Haloperidol has the highest clinical evidence amongst pharmacological agents for use in agitated delirium refractory to non-pharmacologic measures [13–15]. Using the lowest effective dose of this high potency antipsychotic is recommended, and as this medication may cause multiple adverse effects (including QT prolongation, torsades de pointes, withdrawal dyskinesias, etc), patients started on this medication should be closely monitored [13–15]. Other pharmacological agents that have been studied in the management of in-hospital delirium include Gabapentin, second-generation antipsychotics such as Risperidone, Olanzapine, as well as other medications like Cholinesterase Inhibitors, Statins, Corticosteroids, Tryptophan, and Melatonin; however, current data for such pharmacological treatment remains controversial [13]. It is important to remember that certain medications can also result in adverse events. High-potency antipsychotics are contraindicated in Parkinson's disease and Lewy body dementia [14]. Benzodiazepines, such as lorazepam, are not recommended as first-line agents in the treatment of delirium because they often exacerbate mental status changes and can cause over-sedation [13].

In summary, acute delirium in the hospital setting should be managed using a combination of non-pharmacological and pharmacological methods. Had the patient in the case scenario outlined above been approached with the mindset of delirium prevention, some of the patient safety-related adverse events might have been avoided.

3.3. Fall prevention in the elderly

Among older adults, the incidence of in-hospital falls ranges from 6 to 15.9 per 1000 patient days, and a single fall could lead to an approximate increase of $4000 per hospitalization [16, 17]. As such, all providers should conduct a careful history and physical examination aimed at identifying those at increased fall risk in order to reduce in-hospital fall events. Historical clues include a history of previous falls at home, use of an assistive device and any underlying visual or hearing impairment [18, 19]. During the initial examination, a patient's gait, balance, strength, cognition, and mood should also be assessed [18, 19]. Once at-risk patients are identified, several interventions can be started to reduce fall risk including: (1) encourage early mobility, (2) avoid use of restraints, (3) minimize use of medications that contribute to falls, (4) use assistive devices like walkers or canes as indicated, (5) address sensory impairments like vision difficulties with patients home equipment, and (6) provide early inpatient physical therapy [20, 21].

Supplementation with Vitamin D3 has also been shown to be effective in fall reduction in nursing facilities [22]. Multifactorial interventions, increasing patients' awareness of their fall risk through bedside teaching, and careful medication review by clinical pharmacists may also decrease the occurrence of falls; however, continued research is needed in this area [20, 21].

3.4. Use of restraints in the hospital setting

The use of restraints in the elderly is sometimes necessary, such as when the patient poses a threat to themselves, to staff members, or to other caregivers and family. The goal of restraint use is to limit a patient's movement, and should only be used after other methods to calm or redirect the patient have failed. Specific instances were restraints may be necessary include violent behaviors (hitting, biting, scratching, etc) as well as non-violent behaviors (pulling on lines or tubes, interfering with medical care resulting in self-injury, etc). Types of restraints can range from physical (such as waist belts, wrist restraints, mittens or side-rails) to the use of chemical restraints (such as medications like lorazepam or haloperidol) to sedate the individual [23].

The use of restraints in the hospital, however, could potentially lead to adverse events including falls, injury, and even at times death. As such, the use of restraints in the hospital setting is controlled by the specific state and federal regulations, such as those described by the Joint Commission, in addition to individual hospital guidelines [23]. The Joint Commission outlines several items related to restraint use in hospitals, including (1) when restraints are clinically justified, (2) how a physician is to order restraint use, (3) how to safely implement restraint use to a patient's plan of care, (4) how to evaluate/care for the patient properly while under restraints, and (5) how to report death and injury as a result of restraint use [23].

In the clinical case outlined above, while soft restraints might have initially felt to be appropriate to manage an unsafe situation, its use was involved in a chain of patient safety events including a fall, traumatic pulling off a foley catheter and resulting hematuria, and worsening of delirium symptoms.

4. Latent causes

After having reviewed a few specific active causes related to patient safety in this clinical scenario, let us investigate further the latent causes or systemic factors that may have contributed to patient safety events for the hypothetical patients in this case.

4.1. Culture of safety

The broadest category for systemic or latent causes of adverse events in a health system is the 'culture of safety' practiced by the individuals within it. A 'culture of safety' can be described as all of the characteristics, attitudes, behaviors and perceptions of individual health care professionals who consciously play an active role in promoting the patient's health and safety [24, 25]. Given the high-cost burden that anyone adverse event can have, most healthcare systems have now adopted various strategies to improve teamwork and embrace a philosophy where the best patient outcomes become a shared goal. High-Reliability Organizations aim for an ultimate goal of no errors and has been promoted by the Agency for Healthcare Research and Quality as an aim all healthcare systems should strive for [4, 25].

A few methods through which a culture of safety can be achieved within the healthcare setting include safe transitions and handovers between team members, efficient and accurate use of

health information technology, and training in a blame free error reporting and error disclosure [24–27]. Improving team dynamics can reduce error by allowing teammates to coordinate their care, improve efficiency, and reduce stress and fatigue. Given that each team member brings different skills to the care of the patient, creating an environment where all team members share responsibility allows each to safely question and escalate issues that could potentially impact patient safety without fear of backlash [24]. In addition, safety huddles and multidisciplinary team based rounding enables all members of the team to provide input into the plan of care and identify potential obstacles and errors earlier on during the course of a patient's stay [24–27].

In our case above, several team members correctly identified patient safety events and brought it to relevant provider's attention to be addressed, and all quickly responded to reduce the severity of the error. In addition, while the resident in the case appeared horrified at the magnitude of the error, the calm and team-oriented approach taken by the attending physician serves as an example of a positive culture of safety. Key components of a culture of safety are outlined in **Figure 1**.

4.2. Using clinical informatics to reduce error

Due to the impact that medication errors have on healthcare outcomes, the use of clinical informatics to prevent such errors has emerged in recent years and can potentially result in significant costs savings [28]. Medication management and clinical decision support systems can reduce errors in prescribing, transcribing, dispensing, and administration of medications [29]. For example, an electronic medical record system that utilizes computerized physician order entry may allow for automatic checking of drug interactions and allergy contraindications, or even appropriate dosing based on renal function [30]. Alert functions can be utilized by the physician or provider to reduce medication dosing errors as well. It is estimated that such systems could reduce errors by greater than 50% [30]. Similarly, drug dispensing systems

Figure 1. Schematic representation of key components of a culture of safety.

using automated cabinets, bar coding, packaging, etc, can also significantly reduce errors in medication dispensing and ultimately, administration of medications to the patient [31].

While the use of information technology to reduce medication error is quite promising, it is not without its own limitations. The ability of the software to detect error is a function of the underlying man-made program, which is also susceptible to error. For example, poor system design can increase provider workload, leading to inefficiency and alert fatigue, and can ultimately contribute to other types of downstream medical errors [32]. Multitasking can lead to medication errors, as in the case described, as physicians may jump through charts while ordering medications and inadvertently enter orders into the wrong patient's chart. As such, it is critical that providers continue to stay vigilant to mistakes even when using information technology. One simple tool utilized by High-Reliability Organizations is the STAR (Stop, Think, Act and Review) acronym which can be utilized in multiple settings to reduce errors in settings where patient safety (such as when medications are being ordered) is vital [4, 25]. This simple acronym should remind providers to take a conscious effort to focus on the task at hand to ensure that the correct order is assigned to the right patient [4].

4.3. Same or similar sounding names

A common patient safety risk occurs when hospitalized patients have the same or similar sounding names, which causes confusion in identifying and treating the intended patient. Patient identification errors can occur at any point throughout the course of a patient's hospitalization from meal delivery to procedures and interventions. However, there is an incredible potential for harm and even death, when patient misidentification occurs. It is, however, difficult to determine the true incidence of patient misidentification due to underreporting [33–35]. One study, for example, did identify that over 70% of transfusion errors in New York State occurred as a result of patient misidentification [36]. Likewise, the UK Patient Safety Agency identified 236 errors within 2 years which were related to missing or incorrect patient name bands [37]. Although correct patient identification may seem intuitive, there are several steps that hospital systems should take to prevent identification errors, as outlined in **Table 2**:

1. Identify charts of patients with same or similar sounding names with the name in bold or italics [33]
2. Use two or more separate identifiers (Name, Date of Birth, Medical Record Number, etc) to identify a patient prior to any intervention or care delivery [33, 37, 38]
3. Utilize a barcode system for drug dispensation and for patient identification [35, 37, 39]
4. Patient identity wristbands could also include a picture of the patient to provide an additional level of protection [35, 37, 39]
5. Patient identity should be verified by all providers at the time of charting, order entry, and medication administration [40]
6. Use alerts in the electronic medical record that require the provider to acknowledge and verify that they are in the correct chart if a similarly named patient is also admitted to the hospital [40]
7. Empower patients to become actively involved in the self-identification process prior to any intervention, particularly when a similarly named patient is on the same floor

Table 2. Methods to reduce patient identification errors.

In this clinical scenario, there are several latent causes of patient safety adverse events due to similar sounding names. The patients were both admitted to the same team and were placed on the same hospital floor just a few rooms apart. In addition, as the resident was attempting to multitask, he very easily placed orders on the wrong patient which ultimately led to the medication administration error. Had some of the steps outlined above been in place, the potential for error due to the similarity in names might have been reduced.

4.4. Safe handoffs

Handoffs are the transfer of information during transitions in care and can occur at multiple points during the course of a patient's hospital stay. The handoff is a complex mechanism of communication between care providers and includes transferring of critical information, records and responsibility, all of which impacts patient safety [41]. Ineffective or fumbled handoffs can lead to critical patient safety related events including wrong site procedures, medication administration errors, and even death [41]. As a result, an effective handoff is largely dependent on the interpersonal communication skills of the caregivers involved.

The Joint Commission introduced a national patient safety goal on handoffs to reduce communication-related errors [42]. This patient safety goal requires health care organizations to implement a standardized approach to all handoff communications by emphasizing the transfer of critical patient information [40]. One common approach is the use of sign-out sheets for communication and is often utilized by physicians. The SBAR (Situation, Background, Assessment, and Recommendation) model is being used to bridge the gap between the different communication styles of nurses and physicians to enhance handoff communication [43]. In addition, the use of electronic medical records may be utilized to improve the handoff process by eliminating difficulties with data access or illegible documentation [43].

In the clinical case above, safe handoff between the resident team members is a critical component of ensuring patient's safety. A safe handoff might have included a reminder about similar sounding names, relevant cautions about medication dosing based on age, renal function or allergies, as well as a succinct yet thorough description of the patients' history and plan of care.

4.5. Disclosing error

Medical errors occur; of this, there can be no doubt. A common dilemma for physicians is how–or if–to disclose the error to patients or families. The central ethical tension in this dilemma hinges on the interplay between the four Western biomedical ethical tenets. The unavoidable pragmatic conflict is the legal or financial risks the provider may incur either by openly identifying an error, or knowingly choosing not to disclose one.

Professional societies generally agree that patients have a right to know about their care, including errors that may or may not be directly related to adverse outcomes [44, 45]. These may be good ethical standards, but we believe that no guideline can substitute for a provider's personal sense of ethics. Furthermore, the application of any guideline should be refined by the cross-cultural interactions between a provider, a patient, and family.

In any therapeutic interaction (keeping in mind that all interactions are potentially cross-cultural!), an important first step is identifying how information of any nature should be disclosed. For example, a traditional Latino family may seek multiple familial inputs before making an important medical decision for an elder. In certain Chinese families, the eldest son may hold cultural power; and family members will defer decisions to that son. Identifying dynamics ahead of time is best practice.

Lastly, when encountering a disclosure dilemma, the use of 'therapeutic privilege' should be exercised with caution. According to the ACP Ethics Manual, therapeutic privilege is "is the withholding of relevant health information from the patient if disclosure is believed to be medically contraindicated" [44]. Ultimately, it will be for the provider to decide 1) what information about an error may be medically indicated to disclose, and 2) how that information may be shared therapeutically with the decisional apparatus in the most culturally appropriate way.

5. Summary and conclusion

These two cases highlight multiple patient safety issues, errors and causes for concern–particularly in the relative ease with which such errors occur. While each case on its own presents a patient safety event, the co-mingling of these patients created additional stress points opening the system up to failure. In both cases, a simple error caused or potentially caused significant patient harm and prolongation of the hospital stay. Name similarity, service proximity, and multi-tasking all contributed to the preventable errors. We have discussed the multiple active causes contributing to error as well as contributing conditions such as medication use and dosing in an elderly patient.

Creating a safe space for all team members to be able to pose safety related questions in a blame-free environment and encouraging the disclosure of error whenever it occurs, along with the creation of layers of defense mechanisms (such as the use of computer based technology; simple pictures on wristbands and color coded alerts on handoff/sign-out materials) will all help to foster a true culture of safety within the Healthcare system. Additionally, the cultivation of an Anticipation, Prevention, and Treatment approach to each patient's plan of care, that includes patient safety and the prevention of errors, will move us toward improved care and improved patient satisfaction with the care delivered.

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