The influence of human factors in medication errors: a root cause analysis

Introduction

MC is a 67 year old is a teacher’s assistant at a local elementary school. The patient presents to the hospital for a laparoscopic bladder neck suspension to correct a long standing history of urinary incontinence. All pre-operative diagnostic tests are within normal range. She is cleared for surgery by the attending physician and anesthesiologist. Consent for surgery is signed by the patient.

Admission Nursing Assessment

Past Medical History
Gastrointestinal reflux
Hypothyroidism
Stress Incontinence
Hysterectomy
No history of smoking/substance use

Current medications
Levothyroxine 100mcg; one by mouth every day
Multivitamin; one by mouth every day

General Appearance

Subjective: “My name is MC and my birthday is 11/14/50. I am a little anxious about all this.”
Objective: Well developed, well-nourished female who appears stated age; Grooming, behavior, and speech are appropriate for situation; Cooperative with exam, appropriate eye contact and expressions. Awake, alert, and oriented to person, place, time, and situation.

Vital Signs
Oral Temperature: 98.6 F (37° C)
Blood pressure: 130/70, Left arm
Respirations: 20, regular
Apical Pulse: 98, regular
Weight: 120 lbs. (54.4 kg)
Height 5’4” in (163 cm)

Skin
Subjective: none
Objective: Skin white, warm to touch, good skin turgor; no lesions; nails without clubbing or deformities, pink; capillary refill < 3 secs.
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Head and Face
Subjective: none
Objective: Hair fine, brown with gray patches; distribution appropriate for age; normocephalic; face symmetrical without drooping, no involuntary movements.

Eyes/Ears
Subjective: “I have worn glasses all my life.”
Objective: PERRLA, glasses noted. No ptosis, conjunctiva clear; brows, lashes present with appropriate distribution; External ear without masses, lesions, or tenderness; position and alignment appropriate

Nose/Mouth/Throat
Subjective: “I have seasonal allergies, but not bad.”
Objective: Teeth in good condition, tongue protrudes midline, throat mucosa pink, uvula rises with phonation; tonsils present; gag reflex present.

Neck
Subjective: none
Objective: Neck supple with full ROM, no pain. No lymphadenopathy, trachea midline; carotid pulses 2+/equal bilaterally.

Chest/Breasts
Subjective: “I do not have any pain or discomfort in my chest.”
Objective: Chest expansion symmetric, relaxed; Breath sounds clear bilaterally, no adventitious breath sounds; Breast exam deferred.

Heart
Subjective: “I have never had any heart problems. I do have high cholesterol.”
Objective: Apical impulse noted at 5th intercostal space, left midclavicular line. S1 and S2 sounds auscultated; no extra heart sounds, no murmurs noted.

Abdomen
Subjective: “I do not have any stomach pain.”
Objective: Flat, symmetric with no apparent masses; skin smooth with few striae; no lesions. Bowel sounds present all quadrants, no bruits. Abdomen soft to palpation; no organomegaly; no masses.
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Genitourinary
Subjective: “My bladder has been leaking for years. Since I had a hysterectomy several years ago, I have been dealing with this. I am now using about 2-3 pads an hour. It smells and I just do not want to deal with it anymore.”
Objective: Mild tenderness noted over the suprapubic region on palpation. Urine soaked pad noted in patient bathroom with strong urine smell.

Musculoskeletal
Subjective: None
Objective: Moves all extremities with full ROM.

Neurologic
Subjective: None
Objective: PERRLA; Glasgow Coma Scale=15. Speech clear; tongue midline; gag reflex intact; soft palate and uvula move up midline when patient states “Ahh”

Surgery
MC was transported to the surgery department via stretcher without incident. The pre-operative, intraoperative, and immediate post-operative periods were uneventful. According to the client’s surgeon, “everything went well.” MC was re-admitted to the medical surgical unit with the following orders:

Post-op orders:
NPO until awake, then progress to clear liquid as tolerated
Post-op vital signs per protocol
Normal Saline 0.9 at 125cc/hr
Foley to gravity drain
Pain: Demerol 50-75mg IM or IV q 4-6hrs prn pain and Phenergan 12.5-25mg IV q 4-6hrs prn nausea

Post-operative admission to medical-surgical unit
MC arrives to the room via stretcher, accompanied by the surgical nurse within one hour after surgery. MC experiences residual effects from anesthesia, and answers questions with incomprehensible speech. The nurse checks the patient’s arm band, but does not replace it with an armband that identifies the new room number.

MC is placed on a monitor, which is programmed to take BP, HR, and pulse oximetry every 15 minutes; the alarms are not set for this machine. The patient’s daughter sits in the corner of the
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room, near the window. She has no medical training, but does observe the nursing care being provided. The nurse leaves the hospital room, stating “I’ll be back to check on you in a few minutes.” The daughter reassures MC, who responds by nodding. MC asks for pain medication and holds her lower abdomen. The daughter notifies the nursing staff.


BP 102/56, lying
Apical HR 102, regular
RR 14, regular
Oral Temperature 98.8 F
Pulse oximetry: 93% room air

Neurologic
Objective: Opens eyes to pain briefly, groans intermittently; Glasgow Coma Scale=10

Chest
Objective: Chest expansion symmetric, relaxed; Breath sounds clear bilaterally, no adventitious breath sounds

Heart
Objective: Apical impulse noted at 5th intercostal space, left midclavicular line. S1 and S2 sounds auscultated; no extra heart sounds, no murmurs noted.

Abdomen
Objective: Flat, symmetric, bowel sounds present all quadrants, no bruits. Abdomen soft to palpation; no organomegaly; guarding noted to light palpation

Genitourinary
Objective: Catheter #16Fr draining yellow, clear urine. Tenderness in suprapubic region on palpation.

Pain
Subjective: moaning; “pain”
Objective: patient unable to identify pain level on 0-10 scale; speech incomprehensible

The nurse checks the written post-op orders and returns to the room with Demerol 75mg IV and Phenergan 25mg IV in a single 3cc syringe. The nurse administers the medication and leaves MC’s hospital room, stating she would “check back in a bit.” The daughter remains at her bedside. Within 5 minutes of receiving the medication, MC is snoring. The blood pressure
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monitor continues to collect data, but no one returns to assess the patient. The nurse returns 1 hour and 11 minutes after administration, and MC has stopped breathing. Resuscitation efforts are initiated and MC is transferred to the intensive care unit.

Intensive care unit

MC is admitted to the intensive care unit, where her husband and son observe the nursing care being provided. Her husband displays a flat affect, with intermittent pacing. He rarely speaks and stares down at the tube protruding from his wife’s mouth, while frequently looking up at the cardiac monitor. MC’s brother, an emergency department physician (and only sibling) is present, accompanied by his daughters, who are nurses.

24 hours later

MC is on a ventilator for 24 hours. The attending physician reports that the EEG (electroencephalogram) shows no brain activity. The family decides to take the patient off the ventilator, and she dies peacefully with her family at the bedside. The physician requests an autopsy, but the family declined, stating “what does it matter, she is gone.”

Hospital administrators along with risk management executives are called after the family asks to see MC’s medical records. The request is denied. Administrators and staff are elusive about events leading up to her death. MC’s daughter and son are told that “she had an episode called a PE (pulmonary embolism) and sometimes that happens after surgery.” The administrator immediately begins to discuss a settlement with the family members.

Conclusion

MC’s husband is schizoaffective with mania. He is very intelligent, and earned a Master’s degree in mathematics, prior to the onset of his mental disorder. MC has been his daily caregiver for 20 years. After her death, MC’s husband lived alone for 4 years, with daily assistance from his daughter. He begins displaying confusion, and becomes noncompliant with his medication regimen. He wanders away from his home during the night, and is subsequently placed in a nursing home.

MC’s daughter feels responsible for “not knowing something was wrong with her mother.” MC’s brother rarely speaks of her death. The nieces continue to speak publicly about MC’s death. This death could have been prevented, and the implications are far-reaching. Once the medication has been administered, there are no “do overs.” THINK before you act, the consequences last forever.
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Nurse Educator Information

The information provided is based on real events which occurred in a rural hospital. After a root cause analysis, it was determined that this sentinel event was caused by the nurse. The nurse’s failure to appropriately assess the patient, and her failure to administer an appropriate dose of pain medication after surgery ultimately led to MC’s death. The family was awarded $250,000, which was settled out of court within a few weeks of her death (dollar amount based on tort reform within the state when the incident occurred).

Root cause analysis

Root cause analysis (RCA) helps organizations identify risks or weaknesses in system processes which cause potential harm to consumers, healthcare workers, providers, and health systems. (https://c.ymcdn.com/sites/npsf.site-ym.com/resource/resmgr/PDF/RCA2_v2-online-pub_010816.pdf). Historically, this analysis was completed after a sentinel event occurred. However, the Joint Commission now encourages a proactive, interdisciplinary approach to prevent the occurrence of future sentinel events. The root cause analysis presented in this case study is based on the Joint Commission’s RCA Framework Template (https://www.jointcommission.org/framework_for_conducting_a_root_cause_analysis_and_action_plan/) and can be used to stimulate discussion about the human factor in caring for patients and the consequences of process errors. A root cause analysis template is provided, with additional questions which complement the activity.

Flow processes:

1. What is the intended process flow as defined by protocol, procedures or standards at the time of the sentinel event?
   a. Have students name the correct method for medication administration.
   b. Next, have students discuss deviations from the process as defined by the case study

Human factors:

2. What nursing factors are relevant to the outcome of this case study? Discuss the following.
   a. Fatigue/personal issues
   b. Inability to focus on task
   c. Perceived/actual work overload
   d. Rushing to complete task
   e. Substance abuse
   f. Failure to follow established procedures
   g. Failure to properly assess the patient prior to administration of the medication
   h. Failure to properly set equipment alarms
   i. Work-arounds
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3. Discuss the physician’s role in the outcome of this patient. Should he be held accountable for the outcome?
   a. Hand-written order vs. standardized order
   b. Two medication orders written as one
   c. Wide variation in the dosages

4. In this case study, what factors possibly influenced the nurse’s decision to give the medication as ordered?

Related topics for discussion

Patient identifiers:
1. What types of patient identification processes/protocols should be in place?
2. What information is typically found on a patient wristband?
3. Did this nurse properly identify this patient?

Staffing:
1. What is the typical staffing ratio on a post-operative patient care unit?
2. Identify staffing issues which may have compromised care and led to this sentinel event.

Orientation/Training:
1. What types of annual safety training should be offered to prevent this event from happening?
2. Discuss National Patient Safety Goals (NPSG®)
   (https://www.jointcommission.org/standards_information/npsgs.aspx)
3. Should nurses be required to demonstrate annual competency training?
4. Should charge nurses/supervisors be required to oversee new admissions in a unit? Why/why not?
5. What types of processes/protocols are in place to ensure proper medication administration? Were protocols enough to prevent an error in this case study? Why/why not?

Availability of information:
1. What types of information should be reviewed by the nurse prior to administering a medication? Where can the nurse find this information?
2. What assessment data should the nurse identify as a potential risk to the patient in the case study?
3. Discuss pain in the post-operative patient. What are alternatives to medication administration, in this post-operative patient?
4. What are the protocols regarding who can view patient information at the bedside?
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Technological support:

1. What types of technology are now used in hospitals to avoid potential medication errors?
2. Describe benefits and limitations of technology (barcodes, automatic alarms)
3. Discuss the implications of “work arounds” in patient care. What types of policies should exist for nursing staff who take these short cuts in medication administration?
4. In this case study, would existing technology make a difference in the outcome?
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### Root Cause Analysis Template

<table>
<thead>
<tr>
<th>Policies and Procedures</th>
<th>Post Sentinel Event Assessment</th>
<th>Yes</th>
<th>No</th>
<th>Contributing Factors-Link to case study and hospital environment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Are there written policies and procedures for the nursing tasks performed?</td>
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<td>2. Are procedures consistent with nursing standards?</td>
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<tr>
<td>3. Are policies and procedures clear and available to all staff?</td>
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<td>4. Would this problem be detected by an internal audit or quality control processes?</td>
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<td>5. Were there previous incidents?</td>
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<tr>
<td>6. Was staff involved trained to perform their tasks? Think about all tasks performed when receiving a patient from another unit</td>
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<td>7. Is nursing staff provided an orientation?</td>
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<tr>
<td>8. Are relevant policies and procedures (for this incident) used daily?</td>
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</tbody>
</table>

### Patient Safety Controls

| Patient Safety Controls | | |
|-------------------------| | |
| 9. Were safeguard(s) in use when event occurred? | | |
| 10. If a piece of equipment is involved, is it routinely checked and referred for maintenance? | | |

### Environment

| Environment | | |
|-------------| | |
| 11. Is work area designed for task? | | |
| 12. Is equipment easily accessible? | | |
| 13. Is the level of technology appropriate for the task and nursing area? | | |
| 14. Is environmental stress a barrier to patient care? (noise, lighting, etc.) | | |
| 15. Are emergency drills conducted on a regular basis? | | |

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<tbody>
<tr>
<td><strong>Equipment</strong></td>
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<td>16. Has equipment worked in the past?</td>
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<td>17. Was the equipment designed so that it might be used with a workaround (incorrectly)?</td>
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<tr>
<td>18. Was staff properly trained on the use of the equipment?</td>
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<tr>
<td><strong>Information Technology</strong></td>
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<tr>
<td>19. Is electronic health record (EHR) working properly</td>
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<td>20. Was correct information displayed, but misinterpreted?</td>
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<tr>
<td>21. Did automatic order alerts function correctly?</td>
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<tr>
<td>22. Was staff properly trained on IT system?</td>
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<tr>
<td><strong>Nursing</strong></td>
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<tr>
<td>23. Was staff fatigue a factor in the event?</td>
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<tr>
<td>24. Does scheduling influence personnel fatigue?</td>
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<td>25. Were staff roles and tasks clearly defined and delegated?</td>
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<td>26. Is the staffing mix adequate for work required?</td>
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<td>27. Is there sufficient staff on hand for the clinical care workload?</td>
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<td>28. Is the level of staff experience, training and scope of practice, consistent with tasks?</td>
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<td>29. Is the level of staff supervision appropriate?</td>
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<tr>
<td>30. Is relevant nursing continuing education present?</td>
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<tr>
<td><strong>Communication and Documentation</strong></td>
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<tr>
<td>31. Did the patient receive the correct medication?</td>
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<tr>
<td>32. Was communication (about patient) among staff members in patient care area adequate?</td>
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<tbody>
<tr>
<td>33. Was communication among unit staff adequate?</td>
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<td>34. Were there standardized tools (SBAR, etc.) used to communicate patient information?</td>
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<td>35. Does the organization support a culture of encouraging staff to report near misses or mistakes?</td>
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</table>

Adapted from: VA National Center for Patient Safety [https://www.patientsafety.va.gov/docs/joe/rca_tools_2_15.pdf](https://www.patientsafety.va.gov/docs/joe/rca_tools_2_15.pdf)
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Student Evaluation Tool

<table>
<thead>
<tr>
<th>Grades Behaviors</th>
<th>Novice</th>
<th>Advanced Beginner</th>
<th>Competent</th>
<th>Proficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-100</td>
<td>Consistently incorporates physical, cognitive, and social influences. Anticipates and articulates potential outcomes. Prioritizes key concepts</td>
<td></td>
<td></td>
<td>Consistently incorporates physical, cognitive, and social influences. Anticipates and clearly articulates potential outcomes. Demonstrates synthesis and prioritization of key concepts</td>
</tr>
<tr>
<td>82-89</td>
<td>Identifies physical, cognitive, and social influences; Inconsistently identifies key concepts;</td>
<td>Incorporates physical, cognitive, and social influences; inconsistently identifies important concepts; Inconsistently articulates expected outcomes</td>
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<tr>
<td>74-81</td>
<td>Identifies few important concepts which impedes ability to complete assignment</td>
<td>Needs improvement; Requires frequent direction from the instructor to complete expected outcomes</td>
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<tr>
<td>66-73</td>
<td>Demonstrates inflexible behavior which impedes the ability to complete assignment; demonstrates low level critical thinking behaviors</td>
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<tr>
<td>Below 66</td>
<td>Unacceptable performance based on assignment guidelines</td>
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</table>
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Presentation Evaluation

Objectives

Upon completion of this case study the student will be able to

a. Discuss the implications of medication errors in postoperative patients
b. Analyze a medication error utilizing root cause analysis
c. Demonstrate elements of critical thinking when discussing effects of medication errors

Circle answer that best describes your opinion of this presentation.

1. Presentation met stated the stated objectives
   Poor 1 2 3 4 5 Excellent

2. Information was presented in a clear format
   Poor 1 2 3 4 5 Excellent

3. Current evidence and research was presented in the presentation
   Poor 1 2 3 4 5 Excellent

   Poor 1 2 3 4 5 Excellent

What is the most helpful part of the presentation? Please be specific.

How can this presentation be improved? Please be specific.