



CardinalHealth

SYSTEM ASSESSMENT

FAILURE MODE AND EFFECTS ANALYSIS (FMEA)

Objective

To proactively identify and reduce risk points in the medication use system that may lead to medication safety problems.

Background

Assessment of the medication use system enables hospitals to systematically identify risk points that increase the potential for medication errors and make improvements that reduce the potential for errors to occur. An effective technique for assessing medication use processes is Failure Mode and Effects Analysis (FMEA). This technique has been used extensively in the aerospace and automobile industries. Its use in healthcare has recently been recommended by organizations such as the Institute for Safe Medication Practices (ISMP), American Society of Health-System Pharmacists (ASHP), and The Joint Commission™ (JC).

The Joint Commission implemented new patient safety standards effective July 1, 2001. Standard PI.3.20 states

“An ongoing, proactive program for identifying and reducing unanticipated adverse events and safety risks to patients is defined and implemented”.

Elements of Performance for PI.3.20:

1. Selecting a high-risk process to be analyzed (at least one high-risk process is chosen annually – the choice should be based in part on information published periodically by the Joint Commission about the most frequent sentinel events and risks)
2. Describing the chosen process (for example, through the use of a flowchart)
3. Identifying the ways in which the process could break down or fail to perform its desired function
4. Identifying the possible effects that a breakdown or failure of the process could have on patients and the seriousness of the possible effects
5. Prioritizing the potential process breakdowns or failures
6. Determining why the prioritized breakdowns or failures could occur, which may include performing a hypothetical root cause analysis
7. Redesigning the process and/or underlying systems to minimize the risk of the effects on patients
8. Testing and implementing the redesigned process
9. Monitoring the effectiveness of the redesigned process

Definition

FMEA is the systematic analysis of a process to identify the possible ways it might fail (i.e., failure modes), the effects or results of failures, and the possible causes of failures. The goal of FMEA is to predict how and where systems designed to detect errors fail

and how processes can be improved to reduce the potential for failure. Improvement in processes is achieved through taking actions that:

- eliminate or minimize the possibility of the error occurring,
- stop an error before it causes harm, or
- minimize the consequences of the error when potential error cannot be eliminated.

FMEA is a proactive technique that is most often used to identify and address problems before they occur. In comparison, Root Cause Analysis (RCA), another technique used in analyzing medication errors, is used retrospectively to address problems after they occur. However, FMEA does incorporate some features of RCA and FMEA can be used during RCA to identify actions for improvement.

FMEA not only can increase the safety of processes, but it can also increase the effectiveness and efficiency and reduce the cost of processes.

FMEA is an ongoing process of quality improvement. Even when improvement is made, efforts to improve processes should continue.

Obstacles to Conducting FMEA

You may find obstacles to effectively using FMEA within your organization. Obstacles may include:

- Resistance to change
- Lack of personnel time to participate in the FMEA process
- Lack of resources to implement improvement strategies
- Reluctance to replace immediate, convenient systems with safer systems that may be more time-consuming
- Information management inadequate to provide necessary data
- Inadequate training of personnel in FMEA and Performance Improvement methods and tools
- Lack of leadership commitment and support

What to Analyze

When used as a tool in a medication error prevention program, FMEA should be used to analyze specific medications or drug classes, medication use procedures, medication-related equipment, and other aspects of the medication use system. Good items for analysis include:

- *High-risk Medications*
Examples include:
 - Anticoagulants (i.e., heparin, warfarin)
 - Chemotherapy agents
 - Insulin
 - Lidocaine
 - Midazolam
 - Neuromuscular blocking agents (e.g., succinylcholine, pancuronium, mivacurium)
 - Parenteral calcium salts

- Parenteral magnesium salts
 - Parenteral narcotics
 - Parenteral potassium salts
 - Parenteral sodium chloride greater than 0.9% concentration
 - Vasoactive drugs (e.g., epinephrine, norepinephrine, dopamine, dobutamine)
- *High-Risk, Error-prone Procedures*
Examples include:
 - Dose calculations and measurements
 - Telephone and oral transmission of orders
 - Handwritten and pre-printed orders
 - Choosing proper items from storage locations
 - Use of infusion control devices
- *Changes in the medication use system*
Examples include:
 - New or changed medication use processes (e.g., implementation of automated dispensing units such as Pyxis)
 - New or changed medication protocols
 - Formulary drug reviews
 - Policy and procedure development
- *Incidents or high risk processes reported in the medical literature*
Examples of publications that regularly publish information regarding medication errors include:
 - ISMP Medication Safety Alert!
 - Hospital Pharmacy
 - American Journal of Health-System Pharmacists
 - American Journal of Nursing
 - Journal of Healthcare Risk Management
- *Incidents or high risk processes reported by healthcare organizations and regulatory agencies*
Example organizations and agencies include:
 - Joint Commission (Sentinel Event Alerts at www.jointcommission.org)
 - FDA (www.fda.gov/cder/drug/MedErrors)
 - USP (www.usp.org)
 - ASHP (www.ashp.org)
 - NCCMERP (www.nccmerp.org)
 - NAHQ (www.nahq.org)
 - NPSF (www.npsf.org)
- *Incidents or high risk processes identified at your facility*
Items for analysis may be identified through:
 - Voluntary reporting of incidents

- Observation of medication use processes
- Review of patient medical records (esp. the medication administration record)
- Surveys of practitioners and patients
- Performance improvement data
- Evaluation of missing or unadministered doses of medications

Team Composition

When used in a medication error prevention program, FMEA is most effective when conducted by a multidisciplinary team. When forming the team, include representatives of all disciplines involved in the process being analyzed.

Members should include pharmacists, nurses, physicians, and risk managers.

Other potential members include:

Pharmacy technicians	Nursing unit secretaries
Dieticians	Materials management personnel
Laboratory personnel	Information systems personnel
Radiology personnel	Respiratory therapists

✓ **Helpful Tip:**

Keep the size of the team manageable. A team of 10 or fewer members is generally the most effective and efficient.

Analysis of the Chosen Process

a. Ensure that all team members understand the process being analyzed. FMEA requires that a process be tracked from the point of initiation until completion. A helpful tool is a flow diagram of the process. Appendix A is an example of a process flow diagram.

✓ **Helpful Tips:**

- The team may develop the diagram, but this can be time consuming for complex processes. If time is a factor, process flow diagrams can be prepared in advance and presented to the team. The team can then review the diagram and make any necessary revisions.
- Ensure that the project is manageable. If the process is complex or involves a large number of subprocesses, identify an area in the process for analysis. Develop flow diagrams of the subprocesses in this area.
- Use a system of numbering or lettering for process and subprocess steps to facilitate tracking of the process.

b. Evaluate each step in the process flow diagram to determine what could go wrong with the process (i.e., potential failure modes). Use various performance improvement tools and techniques to identify potential failure modes (e.g., brainstorming, cause and effect diagrams). For example, the team may determine that selecting the wrong strength of cisatracurium in surgery may result in a medication error (a failure in the process).

- c. Identify the effects (i.e., the results) of the failures. For example, if the wrong strength of cisatracurium is administered in surgery, the effect could be prolonged recovery and increased monitoring needed for the patient.
- d. Identify any safeguards or controls already in place that increase the likelihood of detection for each failure mode.
- e. Prioritize the failure modes to identify those that pose the greatest risk using ranking scales to estimate frequency of occurrence, severity of effects, and the probability of detection. The ranking scales are a qualitative tool used to prioritize areas needing focus.
 - The team estimates the probability of each failure mode occurring using a ranking scale. The team should take in consideration documented reports of the failure in the literature as well as through the hospital's medication incident reporting system.
An example ranking scale is shown below:

FMEA Occurrence Ranking Scale

<i>Ranking</i>	<i>Category</i>	<i>Criteria</i>
1	Remote	Possible, no known occurrence
2	Low	Rarely occurs (i.e., yearly)
3	Moderate	Infrequently occurs (i.e., monthly)
4	High	Frequently occurs (i.e., weekly)
5	Very High	Almost always occurs (i.e., daily)

Adapted from: Williams E, Talley R. *Hosp Pharm.* 1994;29:331-2, 334-7.

- The team estimates the severity of the *effects* of each failure mode using a ranking scale. An example scale is shown below:

FMEA Severity Ranking Scale

<i>Ranking</i>	<i>Category</i>	<i>Criteria</i>
1	No Harm	No harm to patient
2	Minor	Temporary harm to patient; monitoring or minor intervention required
3	Moderate	Temporary harm to patient; initial or prolonged hospitalization required
4	Major	Permanent harm to patient
5	Severe	Terminal injury or death

- The team estimates the probability of each failure mode being detected using a ranking scale. An example scale is shown below:

FMEA Detection Ranking Scale

Ranking	Category	Criteria
1	Very High	Error will almost always be detected (95-100%)
2	High	Error frequently detected before reaching patient (75-94%)
3	Moderate	Error infrequently detected before reaching patient (40-74%)
4	Low	Error rarely detected before reaching patient (6-39%)
5	Remote	Detection not possible at any point in the system (0-5%)

Adapted from: Williams E, Talley R. *Hosp Pharm.* 1994;29:331-2, 334-7.

✓ **Helpful Tips:**

- The ranking scales should be meaningful to the team and the process being reviewed.
- Keep the scales simple.
- Develop definitive criteria for each ranking score.

f. Calculate the Criticality Index (CI) for each failure mode using the following formula:

$$CI = O \times S \times D$$

Where O = frequency of occurrence ranking
 S = severity of effects ranking
 D = probability of detection ranking

Note: another term often used for this number is the Risk Priority Number (RPN).

g. Assign a priority ranking for each failure mode by listing in decreasing order of Criticality Index. A sample form for assigning priority ranking is included in the forms section.

h. Beginning with the failure modes that have the highest CI values, identify the root causes that can produce each failure mode or error. Performance improvement tools that are helpful for identifying root causes include cause and effect (fishbone) diagrams, affinity diagrams, and brainstorming. For the cisatracurium example cited above, root causes may include look-alike packaging and the availability of multiple concentrations of the medication.

✓ **Helpful Tip:**

If a large number of failure modes are identified, it is more effective to address the highest rated failure modes initially. The rest of the failure modes are addressed later in descending order. Solutions to the failure modes with the highest CI's may also be solutions to less significant failure modes.

Some organizations establish a threshold or "cut-off" CI to establish which failure modes will be addressed. Those below the threshold or cut-off point are addressed only if there is time to do so.

Identify Strategies for Improvement

- Identify actions or strategies that could reduce the Criticality Index for each failure mode. Include actions that:
 - decrease the likelihood of occurrence (i.e., prevent the failure from happening)
 - decrease the severity of effects (i.e., minimize the consequences of failure on the patient), and
 - increase the probability of detection (i.e., prevent the failure from reaching the patient).

Appendix B contains examples of the types of strategies and actions that may improve the safety of a process.

✓ **Helpful Tip:**

Don't reinvent the wheel! Look at actions and strategies implemented by other healthcare organizations or recommended by professional organizations such as ASHP, JCAHO, and ISMP.

- After possible solutions are identified, the team decides which actions can be implemented without being impractical or significantly impacting the efficiency and effectiveness of the process.

When deciding which actions or strategies to implement, the team should consider the following factors:

- Likelihood that failure mode will be prevented
- Likelihood of a long-term vs. short-term solution
- Reliability of strategy or action (i.e., will it always work)
- Impact on other processes, resources, and schedules
- Practicality
- Barriers to implementation
- Cost of implementation
- Time needed to implement
- How improvement can be measured

✓ **Helpful Tip:**

The success of FMEA is dependent upon clear, detailed documentation.

Use of a worksheet can assist the team in the analysis, particularly since the analysis will probably involve several meetings of the team. Appendices C, D, and E are examples of FMEA worksheets.

Several worksheets may be needed to accommodate a process.

Appendices F and G show examples of how worksheets may be used to analyze a process.

Implementation of Strategies for Improvement

- Develop an action plan to implement the improvement strategies. A sample action plan template is provided in the forms section.

- Develop process and outcome measures, as appropriate, to assist in the evaluation of the effectiveness of actions taken.
- Decide if baseline measures of key process issues are needed and complete prior to implementation of the action plan.
- Implement the action plan.

✓ **Helpful Tip:**

Conduct a pilot of the process changes or other actions for improvement in a selected area before facility-wide implementation to test the effectiveness of the changes and identify any major problems.

Monitoring/Follow-up

Evaluate the effectiveness of each action taken. Recalculate the Criticality Indices of the failure modes to determine if the actions have had an effect. Evaluate outcome and process measures to determine the effectiveness of process changes. If baseline measures were completed prior to implementation of changes, conduct the measures again and compare to the baselines to determine the effect of the actions.

If the Criticality Index is not reduced for a failure mode or other indicators such as process and outcome measures or reassessment of baseline measures do not indicate improvement, the team continues with the FMEA process to identify and implement new improvement strategies. However, even if improvement is found, efforts must be made to continuously improve the process.

Resources:

1. The Joint Commission. *Failure Mode and Effects Analysis in Healthcare: Proactive Risk Reduction*. 2nd ed. Oakbrook, IL: The Joint Commission, 2005.
2. VA National Center for Patient Safety (NCPS), www.patientsafety.gov/HFMEA.html, 2002.
3. Cohen MR, Senders J, Davis NM. Failure mode and effects analysis: A novel approach to avoiding dangerous medication errors and accidents. *Hosp Pharm*. 1994; 29:319-24, 326-8, 330.
4. Senders JW and Senders SJ. Failure mode and effects analysis in medicine. In: Cohen, MR, editor. *Medication Errors*. Washington, DC: American Pharmaceutical Association, 1999. p.3.1 - 3.8.
5. Cohen MR. One hospital's method of applying failure mode and effects analysis. In: Cohen, MR, editor. *Medication Errors*. Washington, DC: American Pharmaceutical Association, 1999. p.4.1 - 4.3.
6. McNally KM, Page MA, Sunderland VB. Failure mode and effects analysis in improving a drug distribution system. *Am J Health-Syst Pharm*. 1997; 54:171-7.
7. Williams E and Talley R. The use of failure mode and effects analysis in a medication error subcommittee. *Hosp Pharm*. 1994; 29:331-2, 334-7.
8. Fletcher, CE. Failure mode and effects analysis: An interdisciplinary way to analyze and reduce medication errors. *J Nur Admin*. 1997; 27(12):19-26.

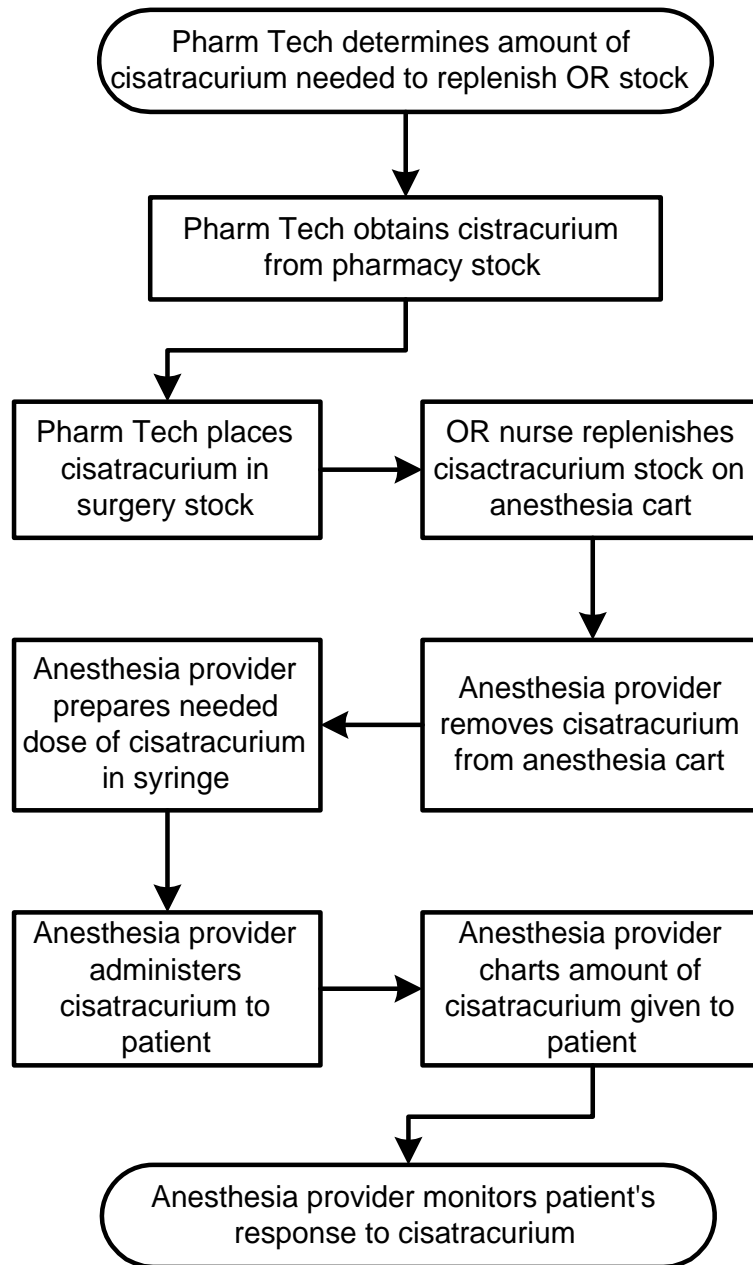
9. Joint Commission Sentinel Event Alert #16: Assessing Risk in Medication Use. February 27, 2001.
10. The Joint Commission. *Tools for Performance Measurement in Healthcare: A Quick Reference Guide*. Oakbrook, IL: The Joint Commission, 2002.
11. Brassard M and Ritter D. *The Memory Jogger II: A Pocket Guide of Tools for Continuous Improvement and Effective Planning*. Methuen, MA: GOAL/QPC, 1994.

APPENDICES

- **Appendix A: Example Process Flow Diagram**
- **Appendix B: Strategies for Eliminating or Minimizing the Impact of Errors**
- **Appendix C: FMEA Criticality Index Worksheet**
- **Appendix D: FMEA Priority Ranking of Potential Failure Modes**
- **Appendix E: FMEA Root Causes & Improvement Strategies Worksheet**
- **Appendix F: Example FMEA Criticality Index Worksheet**
- **Appendix G: Example FMEA Root Causes & Improvement Strategies Worksheet**

Appendix A: Example Process Flow Diagram

Dispensing and Administration of Cisatracurium in Surgery



Appendix B: Strategies for Eliminating or Minimizing the Impact of Errors

Strategy	Example
Redundancies	Facsimile transmission of new medication orders between the nursing unit and pharmacy allowing both the nurse and the pharmacist to interpret handwritten physician orders.
Fail-Safes	Use of pre-mixed IV drug containers that do not require any activation, assembly, or drug preparation to prepare a dose.
Eliminate items and procedures	Eliminate the use of a dangerous medication when a safer alternative exists or the product is not absolutely necessary to patient care. Eliminate need to calculate drip rates for drug solutions by standardizing concentrations and providing drip charts that enable the nurse to choose the correct flow rate.
Limit use or access	Sequestering potassium chloride concentrated injection and only allowing properly trained and competent personnel access to this product.
Location	Storing drugs with similar names or look-alike packaging in separate locations.
Appearance	Purchasing different size containers or products from different manufacturers to reduce the number of medications with look-alike packaging.
"Lock and Key" design	Placing oral liquid medications in oral syringes that have tips that cannot be attached to needles or IV tubing.
Tactile cues and special packaging	Placing colored, adhesive tape on a medication container to help differentiate from other medications.
Strategically placed warnings, signs, labels	Placing labels on both sides of IV bags so that the contents of the container can be identified regardless of how the container is turned.
Technology	Use of computer-generated medication administration records to reduce transcription errors.
Audible alarms	Alarms on infusion pumps that warn that an infusion has stopped or that air is in the tubing.
Protocols and procedures	Use of a protocol for patient controlled analgesia (PCA) to ensure appropriate dosing, provide monitoring parameters, and provide treatment procedures in case the patient becomes over-sedated.
Documentation	Placing special notes on the MAR to alert nurses of special precautions (e.g., do not crush tablets before administration).
Provide education	Educating nurses in the ICU about neuromuscular blocking agents and protocols for their administration.
Minimize or eliminate the possibility of an error	Automated dispensing units that only allow access to the pocket containing the requested medication instead of access to numerous pockets.
Minimize the consequence of an error	Reducing the amount of drug within a single container (e.g., use single-use vials of lidocaine containing less than 500 mg).

Adapted from: Cohen MR, Senders J, Davis NM. Hosp Pharm. 1994; 29:319-24, 326-28, 330.

Appendix C: Failure Mode and Effects Analysis (FMEA) Criticality Index Worksheet

Process: _____ Date: _____ Page _____ of _____

Process Step	Potential Failure Mode(s)	Occurrence Ranking (O)	Effects of Failure Modes	Severity Ranking (S)	Current Safeguards/Controls	Detection Ranking (D)	Criticality Index (CI) (O x S x D)

<p>a. Occurrence Ranking-</p> <ul style="list-style-type: none"> 1- Remote: possible, no known occurrence 2- Low: rarely occurs (i.e., yearly) 3- Moderate: infrequently occurs (e.g., monthly) 	<p>b. Severity Ranking-</p> <ul style="list-style-type: none"> 1- No Harm: no harm to patient 2- Minor: temporary harm to patient, monitoring or minor intervention required 3- Moderate: temporary harm to patient, initial or prolonged hospitalization required 	<p>c. Detection Ranking-</p> <ul style="list-style-type: none"> 1- Very High: error will always be detected (95-100%) 2- High: frequently detected before reaching patient (75-94%) 3- Moderate: infrequently detected before reaching patient (40-74%)
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4- High: frequently occurs (i.e., weekly) 5- Very High: almost always occurs (i.e., daily)	4- Major: permanent harm to patient 5- Severe: terminal injury or death	4- Low: rarely detected before reaching patient (6-39%) 5- Remote: detection not possible at any point in the system (0-5%)
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Appendix D:

Failure Mode and Effects Analysis (FMEA)

Priority Ranking of Potential Failure Modes

Process Description: _____

Rank	Process Step ID #	Failure Mode Description	Criticality Index (CI)
1			
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4			
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Appendix E: FMEA Root Causes & Improvement Strategies Worksheet

Process: _____ Date: _____ Page ____ of ____

Process Step: _____

Failure Mode: _____ CI = _____

Effects of Failure: _____ Current Safeguards/Controls: _____

Root Causes	Recommended Action(s) for Improvement	Process/Outcome Measures	Persons Responsible	Target Date	Date Completed	New Occurrence Ranking (O)	New Severity Ranking (S)	New Detection Ranking (D)	Revised CI (O x S x D)

a. Occurrence Ranking- 1- Remote: possible, no known occurrence 2- Low: rarely occurs (i.e., yearly) 3- Moderate: infrequently occurs (i.e., monthly)	b. Severity Ranking- 1- No Harm: no harm to patient 2- Minor: temporary harm to patient, monitoring or minor intervention required 3- Moderate: temporary harm to patient, initial or prolonged hospitalization	c. Detection Ranking- 1- Very High: error will always be detected (95-100%) 2- High: frequently detected before reaching patient (75-94%) 3- Moderate: infrequently detected before reaching patient (40-74%)
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4- High: frequently occurs (i.e., weekly) 5- Very High: almost always occurs (i.e., daily)	4- Major: permanent harm to patient 5- Severe: terminal injury to patient	4- Low: rarely detected before reaching patient (6-39%) 5- Remote: detection not possible at any point in the system (0-5%)
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Appendix F: Example Failure Mode and Effects Analysis (FMEA) Criticality Index Worksheet

Process: Dispensing and Administration of Cisatracurium in Surgery

Date: _____ Page _____ of _____

Process Step	Potential Failure Mode(s)	Occurrence Ranking (O)	Effects of Failure Modes	Severity Ranking (S)	Current Safeguards/Controls	Detection Ranking (D)	Criticality Index (CI) (O x S x D)
1. Pharmacy Tech obtains cisatracurium from pharmacy stock	1.1 Wrong drug chosen	2	1.1 Potentially serious effects depending on drug given	5	1.1 Storage bin labeled with drug name and strength	2	20
	1.2 Wrong concentration chosen	2	1.2 Prolonged recovery, increased monitoring	2	1.2 none	2	8
2. Pharmacy Tech places cisatracurium in surgery stock	2.1 Drug placed in wrong location	2	2.1 Prolonged recovery, increased monitoring	2	2.1 Storage bin labeled with drug name	2	8
3. Surgery Nurse replenishes cisatracurium stock on anesthesia cart	3.1 Wrong drug chosen	2	3.1 Potentially serious effects depending on drug given	5	3.1 Storage bin labeled with drug name	2	20
	3.2 Wrong concentration chosen	3	3.2 Prolonged recovery, increased monitoring	2	3.2 none	4	24
	3.3 Drug placed in wrong location on cart	2	3.3 Prolonged recovery, increased monitoring	2	3.3 none	3	12
4. Anesthesia provider removes cisatracurium from anesthesia cart	4.1 Wrong drug chosen	3	4.1 Potentially serious effects depending on drug given	5	4.1 none	2	30
	4.2 Wrong concentration chosen	3	4.2 Prolonged recovery, increased monitoring	2	4.2 none	4	24
5. Anesthesia provider prepares needed dose of cisatracurium in syringe	5.1 Wrong dose prepared	2	5.1 Prolonged recovery, increased monitoring	2	5.1 none	4	16
6. Anesthesia provider administers cisatracurium to patient	6.1 Wrong drug given	2	6.1 Potentially serious effects depending on drug given	5	6.1 Syringe labeled with drug name	5	50
	6.2 Wrong dose given	3	6.2 Prolonged recovery, increased monitoring	2	6.2 none	5	30
	6.3 Drug given by wrong route	1	6.3 Potentially serious effects depending on route administered	5	6.3 none	2	10

<p>a. Occurrence Ranking-</p> <p>1- Remote: possible, no known occurrence</p> <p>2- Low: rarely occurs (i.e., yearly)</p> <p>3- Moderate: infrequently occurs (i.e., monthly)</p> <p>4- High: frequently occurs (i.e., weekly)</p> <p>5- Very High: almost always occurs (i.e., daily)</p>	<p>b. Severity Ranking-</p> <p>1- No Harm: no harm to patient</p> <p>2- Minor: temporary harm to patient, monitoring or minor intervention required</p> <p>3- Moderate: temporary harm to patient, initial or prolonged hospitalization</p> <p>4- Major: permanent harm to patient</p> <p>5- Severe: terminal injury to patient</p>	<p>c. Detection Ranking-</p> <p>1- Very High: error will always be detected (95-100%)</p> <p>2- High: frequently detected before reaching patient (75-94%)</p> <p>3- Moderate: infrequently detected before reaching patient (40-74%)</p> <p>4- Low: rarely detected before reaching patient (6-39%)</p> <p>5- Remote: detection not possible at any point in the system (0-5%)</p>
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Appendix G: Example FMEA Root Causes & Improvement Strategies Worksheet

Process: Dispensing and Administration of Cisatracurium in Surgery Date: _____ Page ____ of _____

Process Step: 6. Anesthesia provider administers cisatracurium to patient

Failure Mode: 6.1 Wrong drug given

CI = 50

Effects of Failure: Potentially serious depending on drug given

Current Safeguards/Controls: Syringe labeled with drug name

Root Causes	Recommended Action(s) for Improvement	Process/Outcome Measures	Persons Responsible	Target Date	Date Completed	New Occurrence Ranking (O)	New Severity Ranking (S)	New Detection Ranking (D)	Revised CI (O x S x D)
6.1.1 Multiple syringes prepared in advance	- Collaborate w/ anesthesia providers to minimize number of syringes prepared in advance	- Monthly random audits to verify compliance w/ actions related to preparation of syringes in advance to ensure medication safety (threshold = 100%)							
6.1.2 Unlabeled/poorly labeled syringe	- Provide training to anesthesia providers re: labeling requirements - Label all syringes - Use color-coded, pre-printed label tape	- Track training of anesthesia providers & ensure completion of training within the next 2 weeks (threshold = 100%) - Purchase & implement use of color-coded, pre-printed label tape two weeks from this date. - Monthly random audits of syringes drawn up in surgery to ensure compliance with labeling requirements (threshold = 100%)							

<p>a. Occurrence Ranking-</p> <p>1- Remote: possible, no known occurrence 2- Low: rarely occurs (i.e., yearly) 3- Moderate: infrequently occurs (i.e., monthly) 4- High: frequently occurs (i.e., weekly) 5- Very High: almost always occurs (i.e., daily)</p>	<p>b. Severity Ranking-</p> <p>1- No Harm: no harm to patient 2- Minor: temporary harm to patient, monitoring or minor intervention required 3- Moderate: temporary harm to patient, initial or prolonged hospitalization 4- Major: permanent harm to patient 5- Severe: terminal injury to patient</p>	<p>c. Detection Ranking-</p> <p>1- Very High: error will always be detected (95-100%) 2- High: frequently detected before reaching patient (75-94%) 3- Moderate: infrequently detected before reaching patient (40-74%) 4- Low: rarely detected before reaching patient (6-39%) 5- Remote: detection not possible at any point in the system (0-5%)</p>
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