Danger Will Robinson!

Identify High Risk PPE-Related Occupational Activities

Disclosure

- Funding and support for this project has been provided by the State of Washington, Department of Labor & Industries, Safety & Health Investment Projects

Overview

- Introductions
- Foundational knowledge
  - What is a “failure modes and effects analysis”
  - Value of simulation
  - Why is it useful
  - What are “best practices” in simulation design to identify risk
- Small group work and JIT trainig
- Take home info and skills

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Introduction / Tables

What is an FMEA

- Risk assessment tool used in many high risk industries
- Proactive- Identifies possible ways a product, service or process can fail
- Prioritizes the actions to reduce future failures

When to use an FMEA?

- Designing new systems, products processes
  - Exposes problems that may result in safety hazard, malfunction, workload issues
- Changing existing systems, products, processes
  - Improve existing operational processes by identifying problem states

- **HOW *EXACTLY* CAN SIMULATION HELP?**

Advantages of Simulation

- Simulate routine events under non-routine conditions

Advantages of Simulation

- Simulate non-routine clinical events

Advantages of Simulation

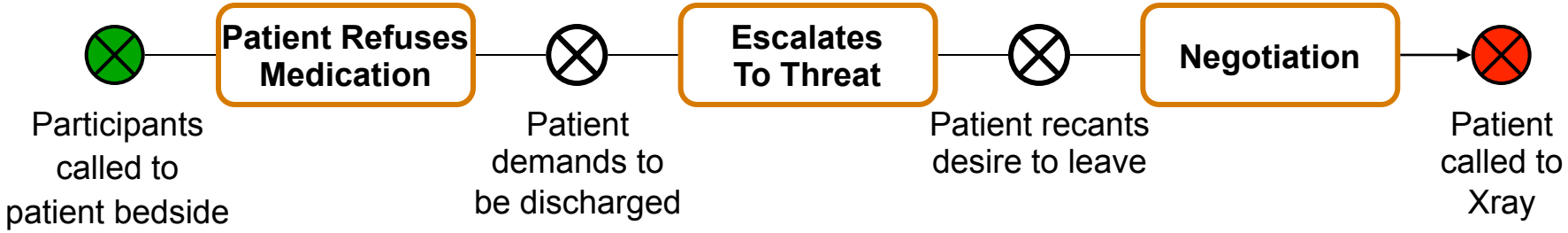
- Understand potential risks of new therapies / protocols

Advantages of Simulation

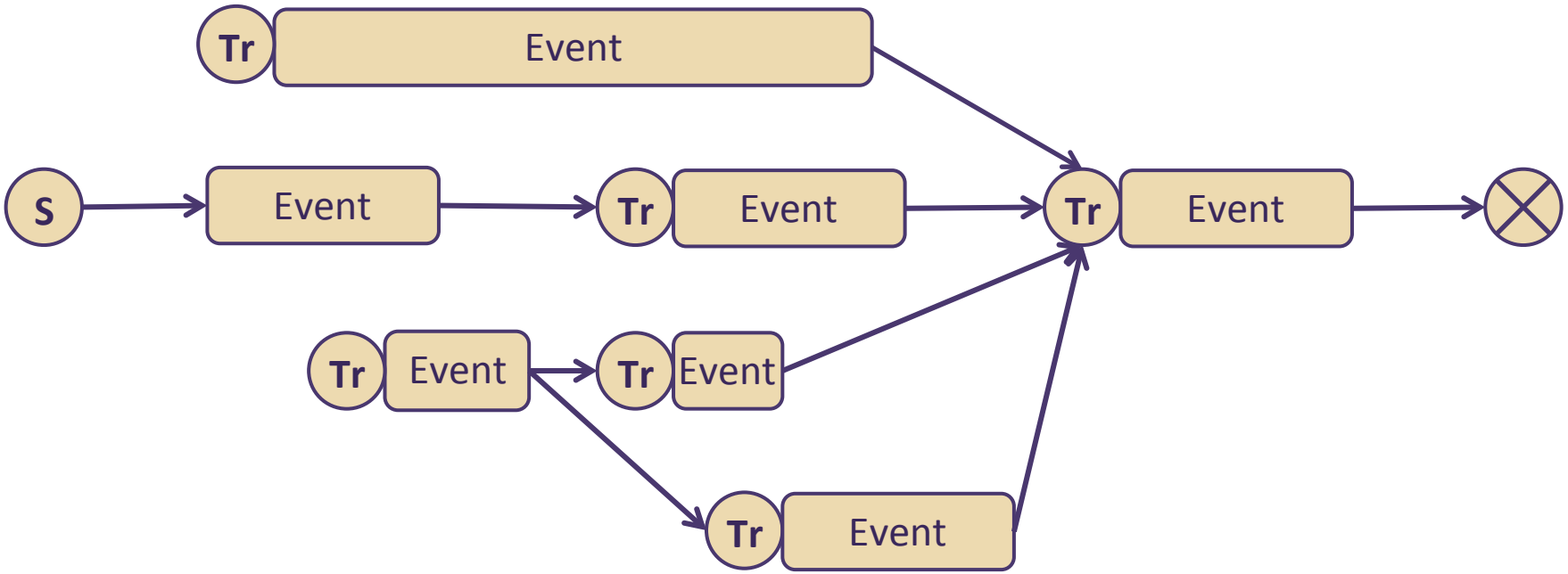
- Deliberate
- Replicable
- Standardized setting
- Allows for direct observation

Event-based Simulation Design

- Event = substantive task with a clear beginning and ending
- Trigger = standardized, scenario-specific indicators embedded in the scenario, designed to force a transition between events



Event-based Simulation Design



Fowlkes J, Dwyer DJ, Oser RL, Salas E: **Event-based approach to training (EBAT)**. *Int J Aviat Psychol* 1998, **8**(3):209-221.

Safety & Health Investment Projects

Personal Protective Equipment Training for Health Care Workers Treating Patients with Highly Contagious Infectious Diseases

Goals

- Identify high risk processes associated with providing care while wearing high level PPE
- Develop an in-depth understanding of the challenges associated with providing care to a patient with copious watery, infectious stool

Clinical Focus

- Provision of hygienic care
  - Linen change
  - Cleaning patient

Objectives

1. Identify the risks (safety threats) associated with specific steps of this process
2. Identify PPE-related risks
3. Identify solutions to the most common or most critical safety threats
4. Use data to inform the development of a Just-in-Time app

Methods

- Simulated process with multiple care teams
- Recorded simulation from multiple views
- Executed FMEA

Hygienic Care Simulation

Behaviors

• Gather linens • Arrange waste receptacles • Ensure adequate disinfectant • Execute pre-brief	• Roll patient • Position devices/ tubes • Remove head/foot • Release fitted sheet • Prepare new linens	• Create barrier on floor • Discuss fecal management system • Revisit Event 2	• Ensure supplies duplicated on other side • Gross contamination check • Repeat Event 2	• Remove all materials from floor • Bleach floor • Clean tubing/ equipment

***OBSERVABLE**

Methods

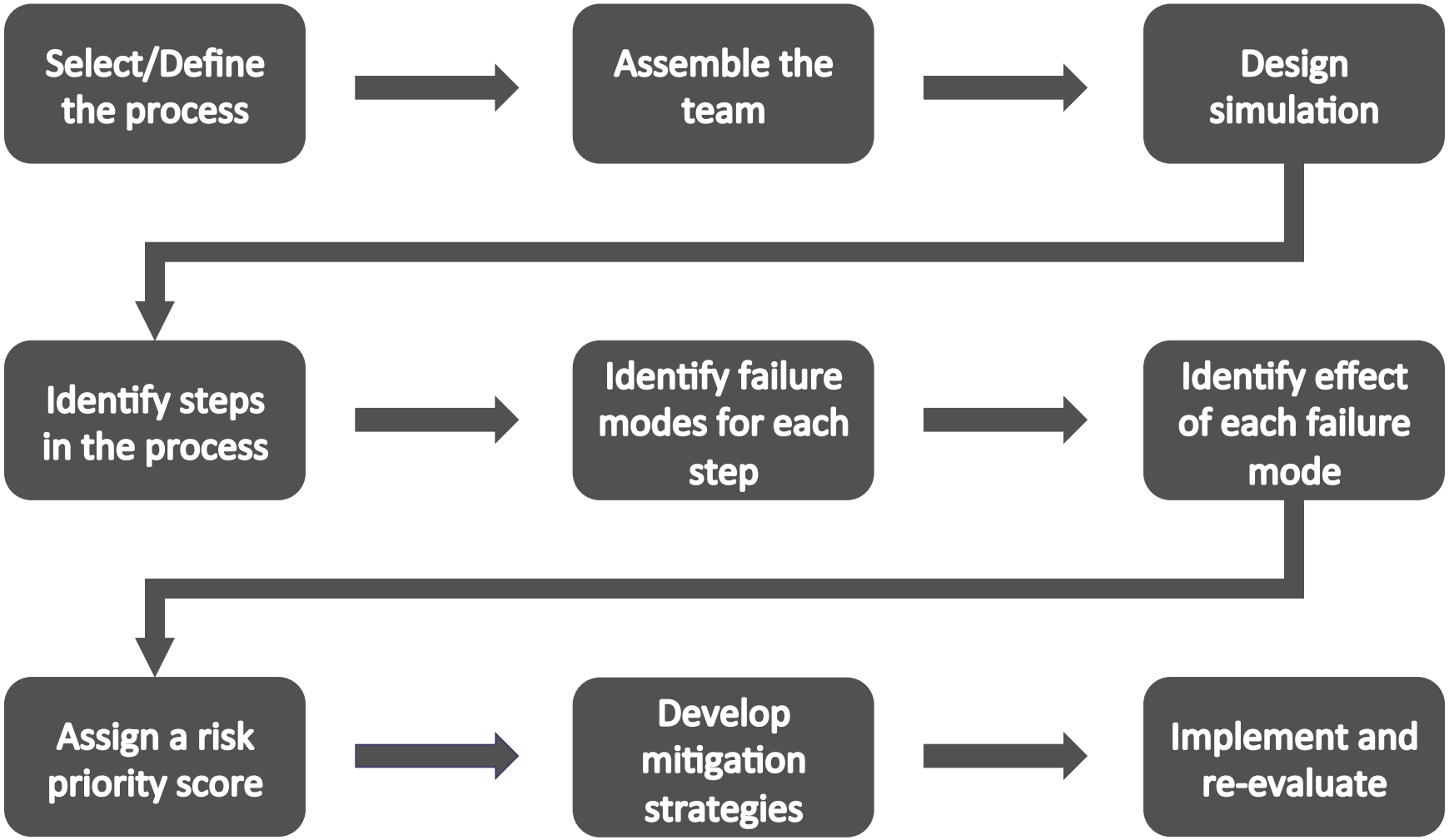
- Simulated process with multiple care teams
- Recorded simulation from multiple views
- Executed FMEA


Observer POV- June 23 2015
Fecal Clean-up Pt 1 - 23JUNE2015_FECAL_POV(OBSERVER)_PART1
00:15:42:02
00:10
-18:33
2015/06/23 10:56:10

Methods

- Simulated process with multiple care teams
- Recorded simulation from multiple views
- Executed FMEA

FMEA Overview



Terminology

- Process
- Potential failure mode
- Mitigation strategy
- Risk Priority Number

Risk Priority Number

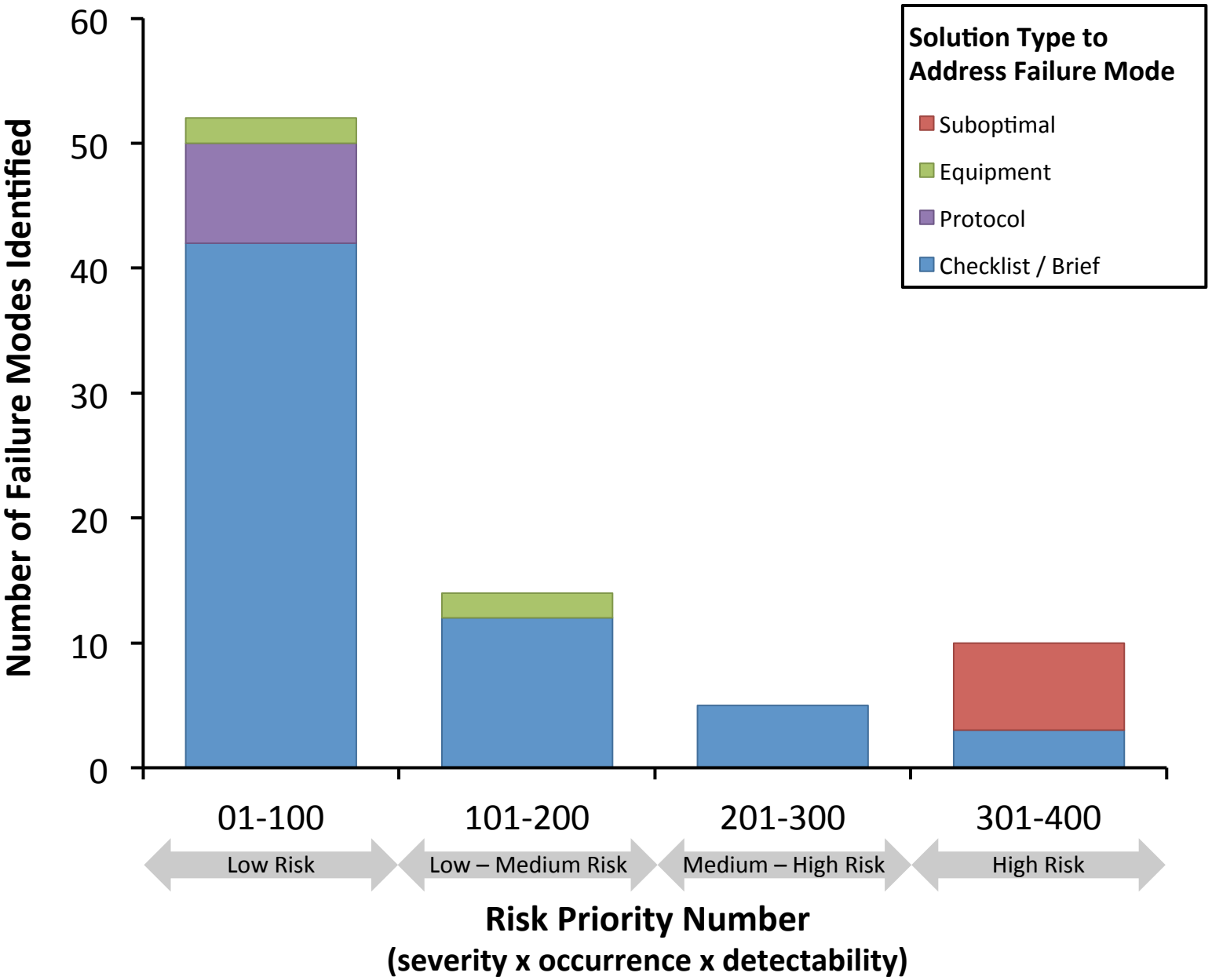
- Severity
  - 1-10, 10 most severe
  - What has the most sever impact on a patient
- Occurrence
  - 1-10, 10 most likely
  - How likely is it this will occur
- Detectability
  - 1-10, 10 is least likely to be noticed
  - How detectible is it, if this occurs?
- RPN= severity*occurrence*detection

Process	Potential Failure Mode	Severity	Occurrence	Detectability	RPN	Possible Mitigation Strategy
Set up blankets on floor to dam liquids (do on both sides of bed)	Item not available in close proximity to provider	7	8	3	168	set up/laundry cart on both sides
	Becoming contaminated (feet)	1	10	1	10	possible speak aloud? Additional layer?
	becoming contaminated, aprons/gowns too long hitting floor	5	5	8	200	tie it up? Additional layer? Relies on observer.
	Spreading agent by kicking towels	4	6	8	192	
	tripping over towels	10	5	1	50	observer come around? Positioning of observer for each step? (is there an SOP if someone goes down?)
	incontinence pads don't stay rolled and only absorbant on one side	4	4	1	16	checklist and procedures for how to dam

Results

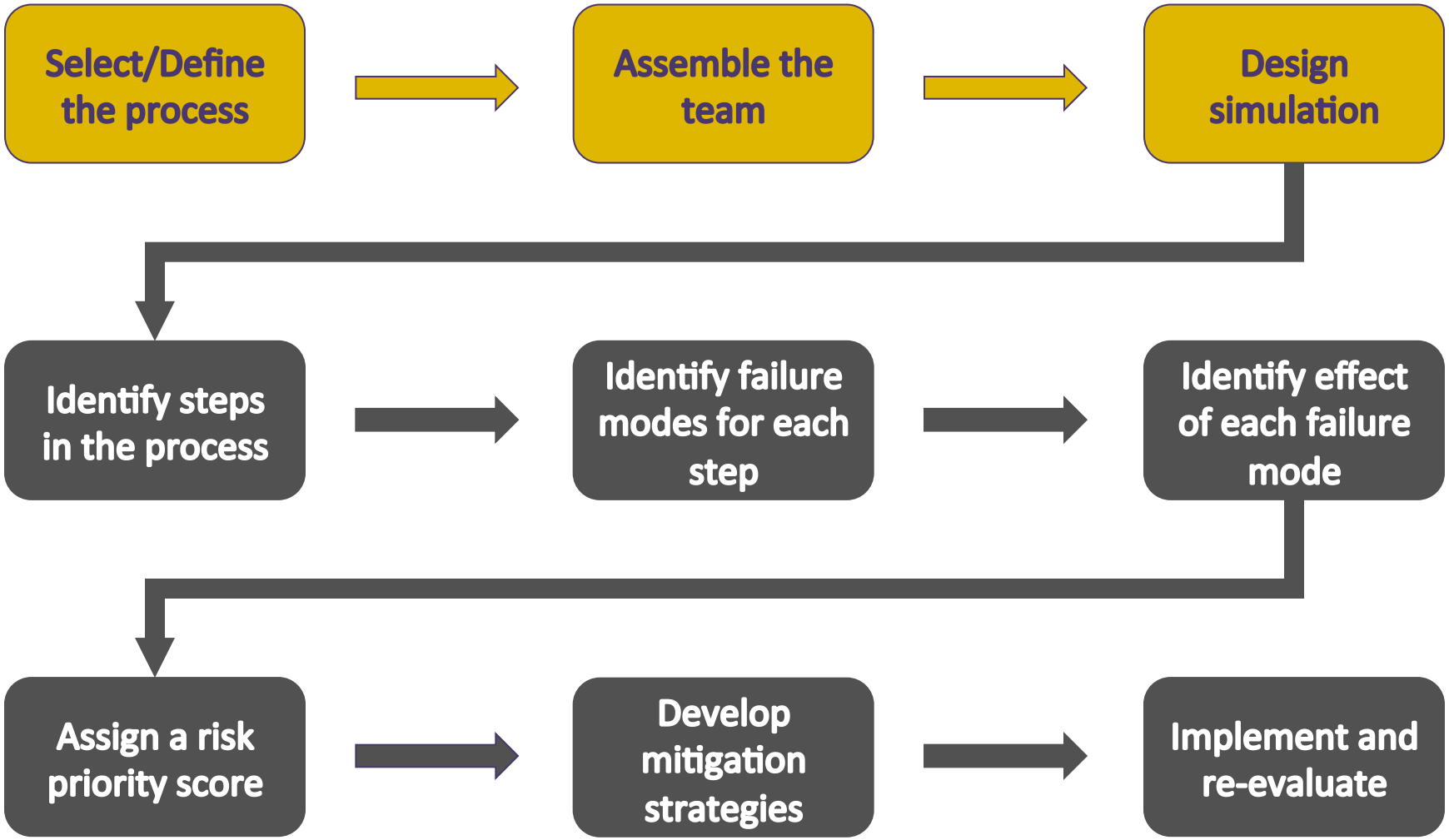
- 16 identified failure modes related to EVD patient hygienic care
- 30 discrete steps
- same failure mode was often associated with multiple steps
  - e.g., provider contamination
- Failure modes ranged in RPN from 6 – 400

Results


Solution Type to Address Failure Mode
Suboptimal
Equipment
Protocol
Checklist / Brief
Number of Failure Modes Identified
60
50
40
30
20
10
0
01-100
101-200
201-300
301-400
Low Risk
Low – Medium Risk
Medium – High Risk
High Risk
Risk Priority Number
(severity x occurrence x detectability)

- **SMALL GROUP WORK**

FMEA Overview



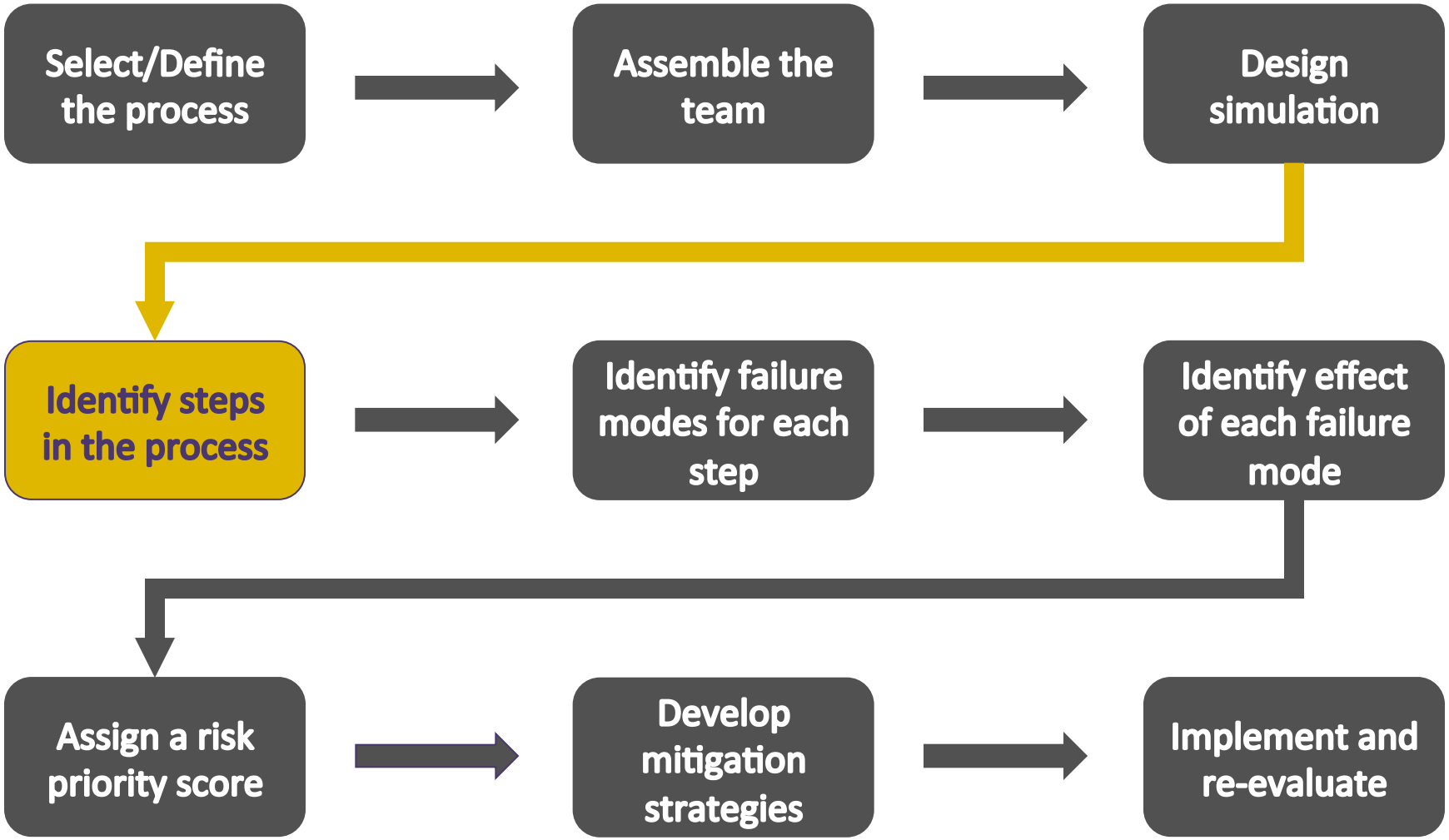
Care of the EVD Patient

- Unique issues
  - PPE
  - Critically ill
  - Teamwork
- Clinical unknowns

Clinical Focus: Fecal Management

- Placing a fecal management system for an EVD patient
- Change the receptacle bag
- Place a clean bag

FMEA Overview



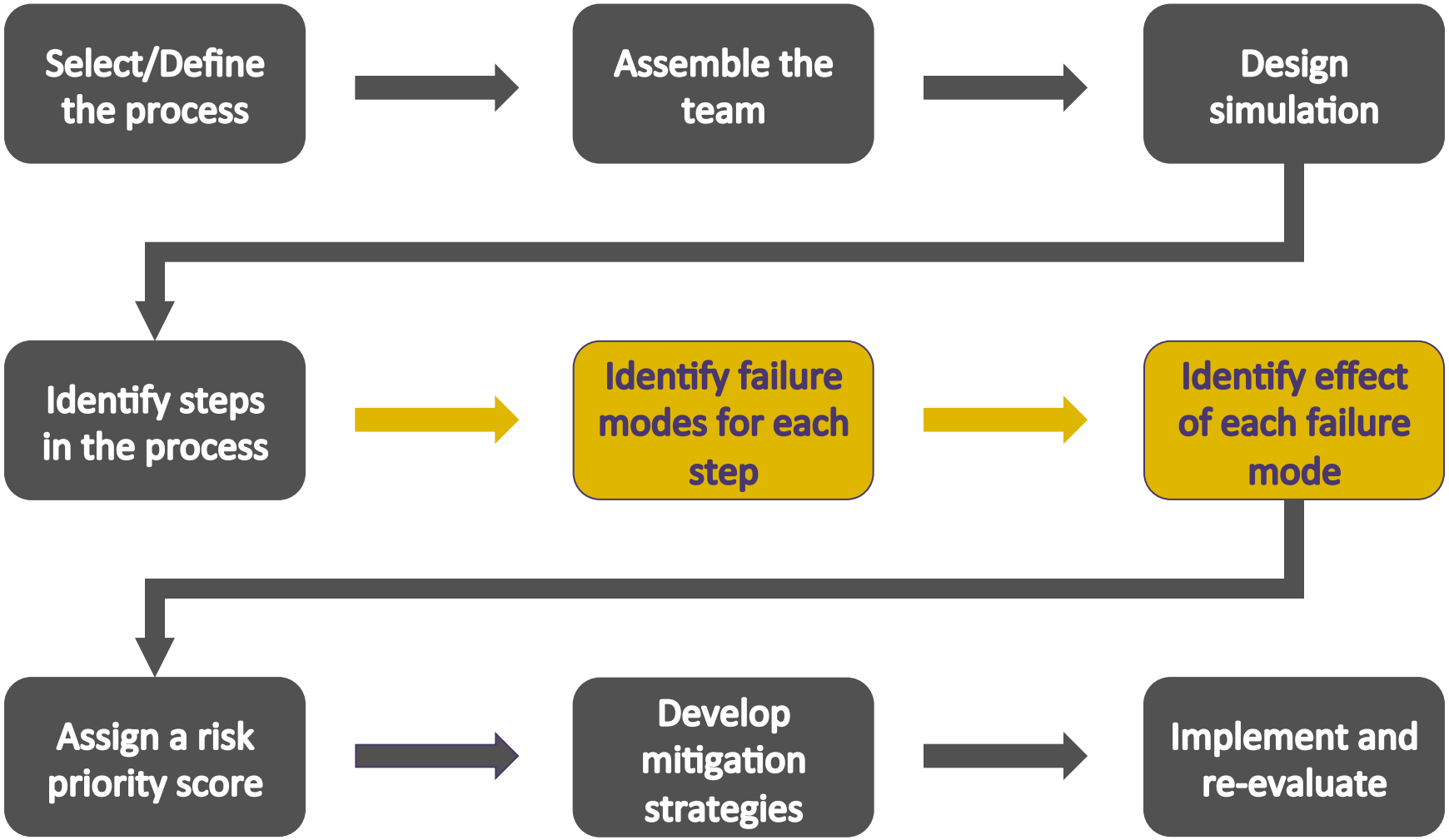
Video

Exercise

- Define the steps in the process

- **REPORT OUT**

FMEA Overview



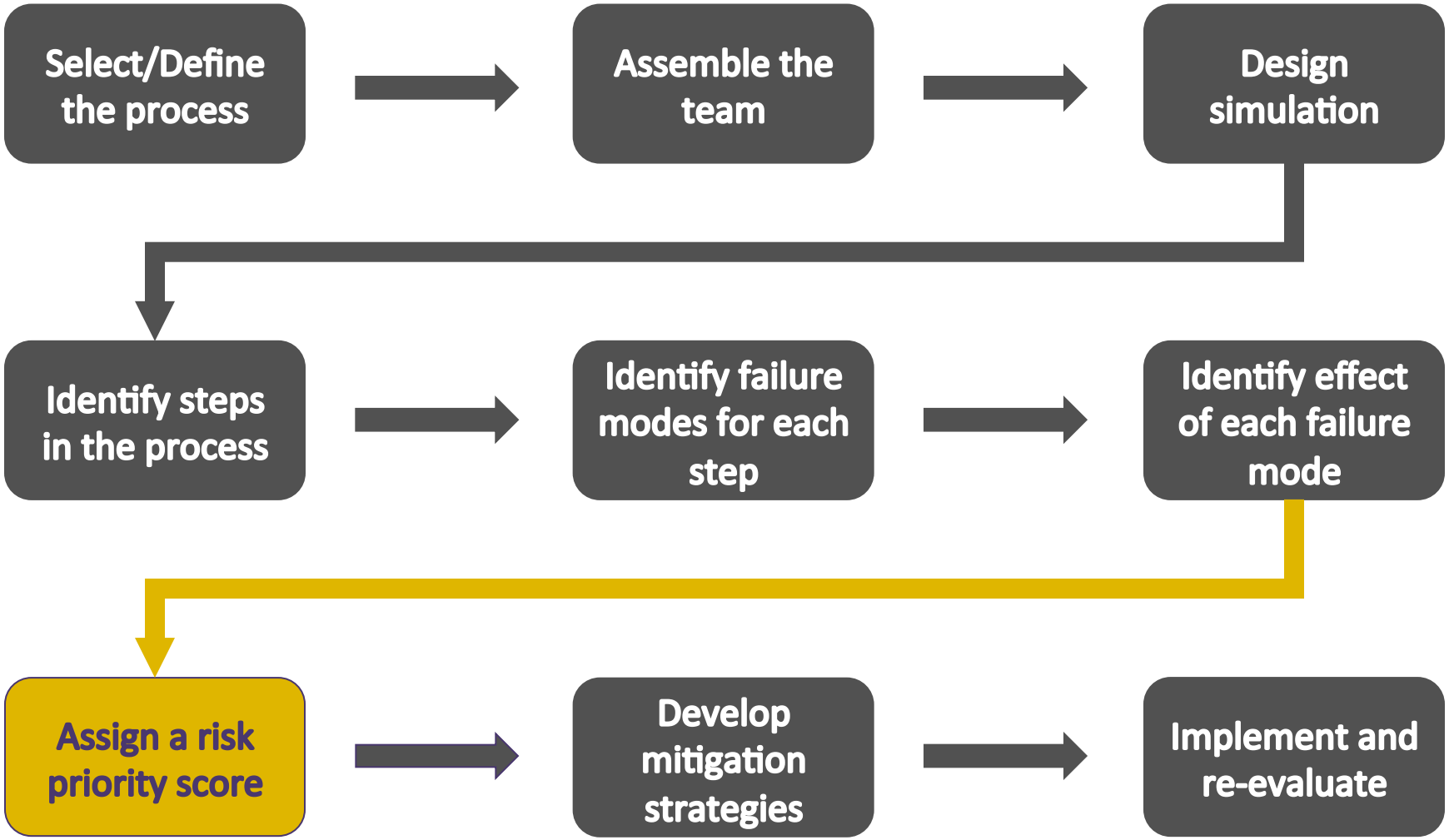
Process	Potential Failure Mode	Effect of Failure Mode
Set up blankets on floor to dam liquids (do on both sides of bed)	Item not available in close proximity to provider	Procedure takes too long and patient declines
	Becoming contaminated (feet)	Increased risk of agent spreading
	becoming contaminated, aprons/ gowns too long hitting floor	HCW exposure
	Spreading agent by kicking towels	HCW exposure
	tripping over towels	Physical injury and difficulty assisting provider
	incontinence pads don't stay rolled and only absorbant on one side	Increased splatter and unrecognized gross contamination

Exercise

- Identify potential failure modes
- Identify effects of each failure mode

- **REPORT OUT**

FMEA Overview



Risk Priority Number

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Exercise

- Calculate risk priority score for each failure mode
  - Severity (1 = not severe ➔ 10 = most severe)
  - Occurrence (1 = rare ➔ 10 = very common)
  - Detectability (1 = easily detected ➔ 10 = undetectable)

RPN = (severity) x (occurrence) x (detectability)

Process	Potential Failure Mode	Effect of Failure Mode	Severity	Occurrence	Detectability	RPN
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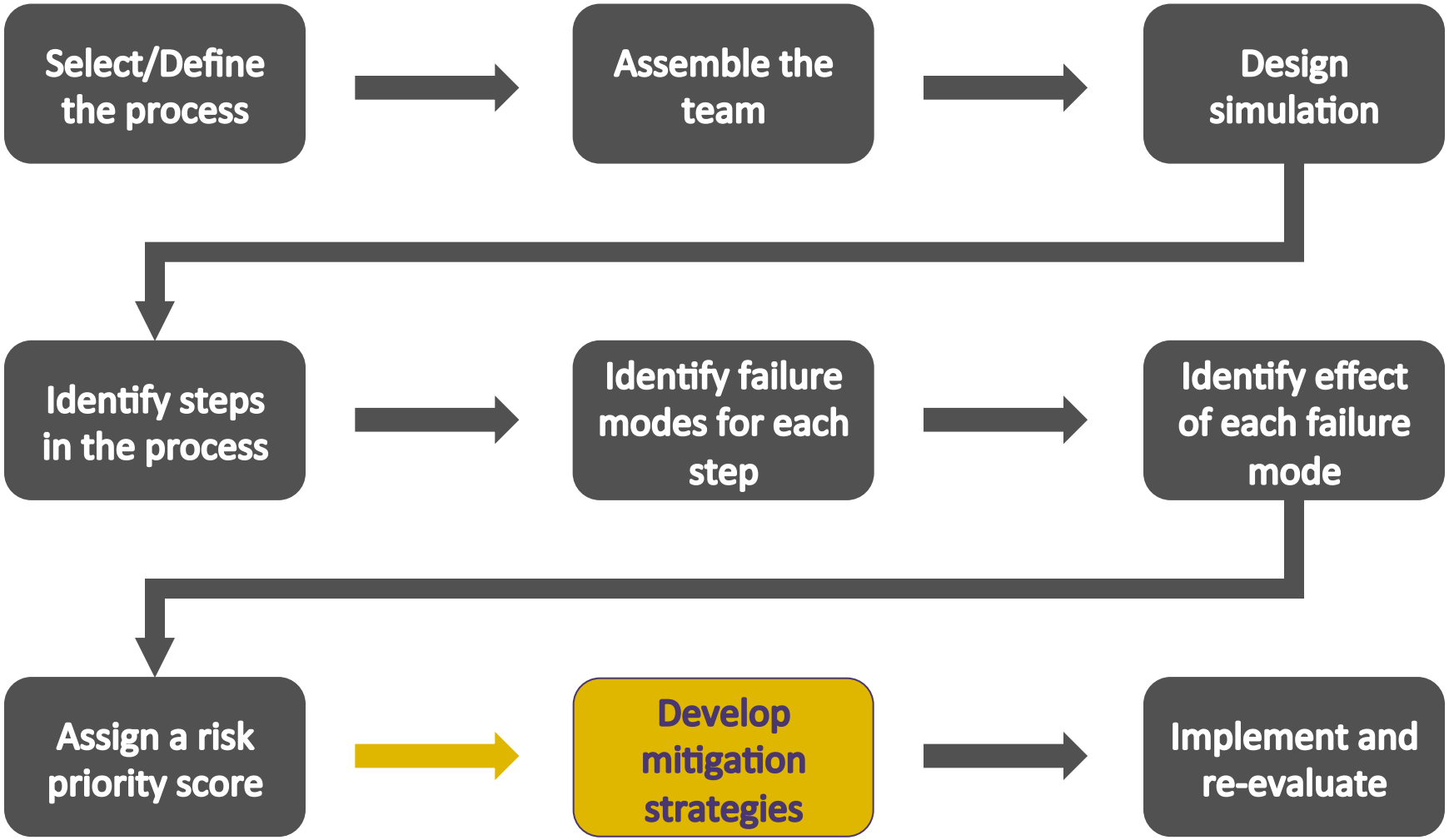
	Spreading agent by kicking towels	HCW exposure	4	6	8	192
	tripping over towels	Physical injury and difficulty assisting provider	10	5	1	50
	incontinence pads don't stay rolled and only absorbant on one side	Increased splatter and unrecognized gross contamination	4	4	1	16

- **REPORT OUT**

FMEA Overview



What Now?

- Rules of thumb
  - Prioritize highest RPN
  - If failure has severity of 10, deal with it even if the overall RPN is low
  - Mitigation strategies

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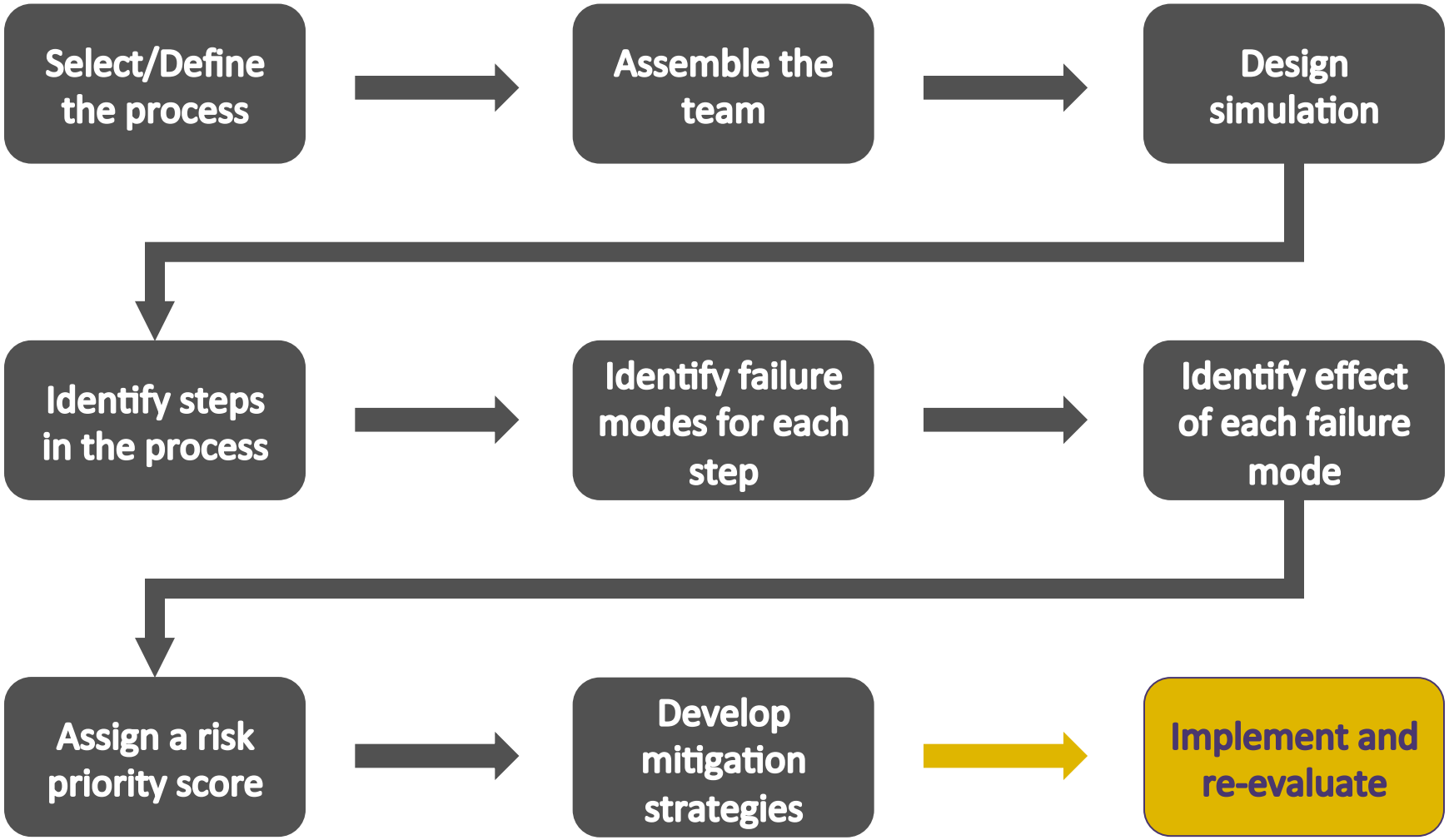
Exercise

- Determine risk mitigation strategies

- **REPORT OUT**

FMEA Overview



Summary

- FMEA is a useful tool for rapidly evaluating risks of a new process
- Event-based simulation allows us to see the new process in action and develop a more accurate FMEA
- Guidebook contains step by step information

Thank you

Sponsor

- Washington State Department of Labor & Industries

Collaborators

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- **QUESTIONS**