

INTRODUCTION

Failure Modes and Effects Analysis (FMEA) is a structured process used to identify and prioritize risks by ranking them based upon severity, occurrence, and detectability. Historically FMEAs have been used to identify risks within industry. In 2000, the Joint Commission incorporated FMEA to prospectively evaluate and redesign processes that led to failures in the healthcare setting. There is little literature on the use of FMEA to evaluate public health programs.

BREATHE EASY AT HOME

Breathe Easy at Home (BEAH) is a multi-sector partnership using a web-based referral system to link clinical sites with housing code inspections and enforcement for patients with asthma. An FMEA was conducted to uncover risks within the BEAH process. This project explored how the FMEA evaluation template can be effectively adapted to a public health program to improve asthma outcomes.

METHODS

An **FMEA team** made up of **physician, community health worker, housing code inspector, city inspectional services administrator, parent of an asthmatic, and public housing authority representatives** met for four sessions. The first meeting used a swim lane chart to map out the BEAH process from referral to inspection, specifically identifying what role and agency was responsible for what tasks. The team met three more times to systematically identify: what needed to happen for each step within the process to be successful, what would happen if that step failed (Failure mode) and what metric it would affect.

Failure modes were then prioritized and ranked based on:

- severity (how bad would it be if this happened?)
- occurrence (how often does this happen?)
- detectability (will it be known in time to mitigate the risks?)

We classified SEVERITY by utilizing four levels:

- minor event (1) moderate event (2) serious event (3) catastrophic (4)

We classified OCCURENCE with four additional levels:

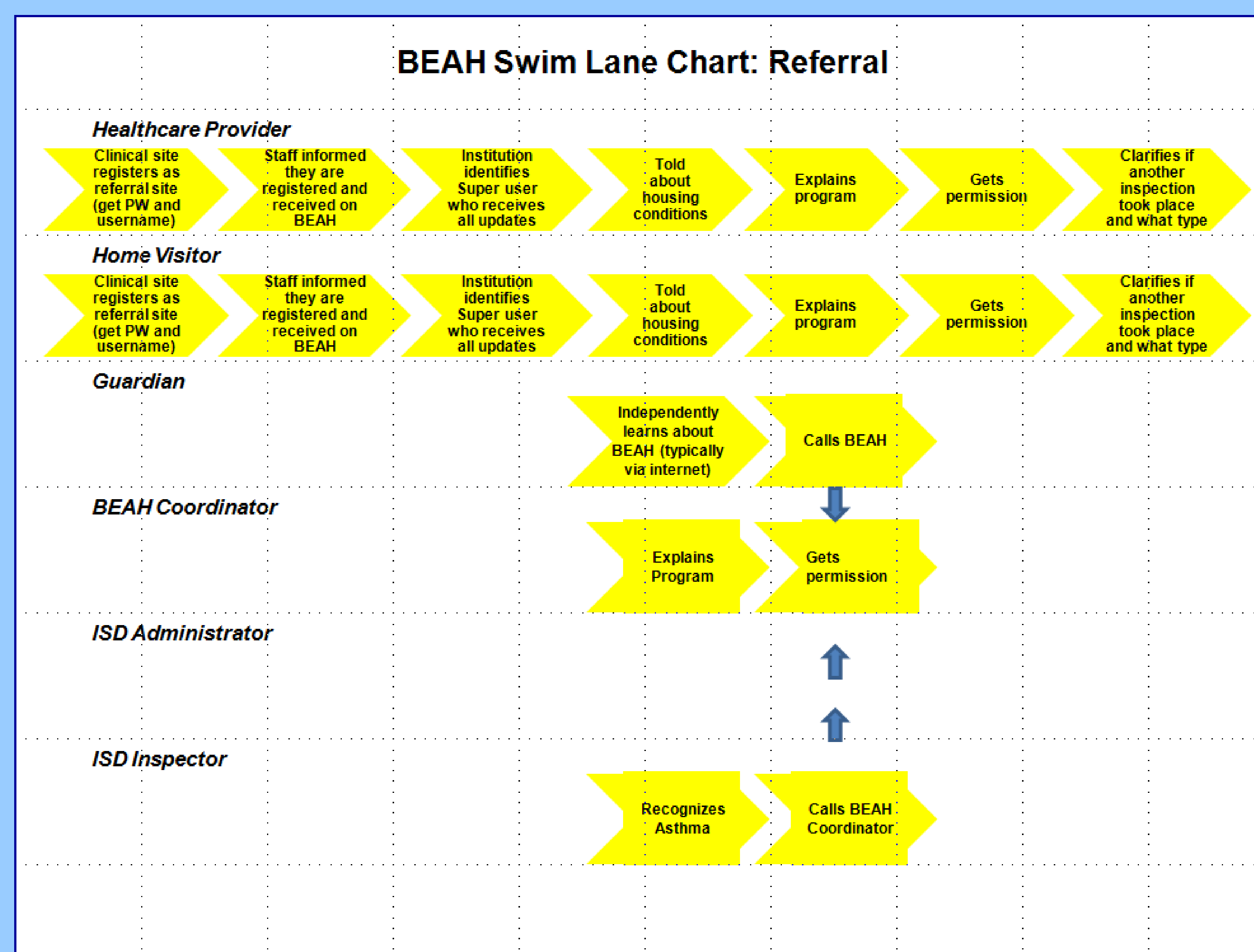
- remote (1) uncommon (2) occasional (3) frequent (4)

We classified DETECTIBILITY with for additional levels

- will know right away (1) will become apparent (2) will know after investigation (3) unable to know (4)

The FMEA team developed an action plan to improve the failure modes that received the highest rankings.

Figure 1: Swim Lane Chart Example



ANALYSIS

The team prioritized risks based on severity, occurrence, and detectability rankings. The Joint Commission recommends using a 10-point scale and the U.S. Veterans Administration recommends using a four level approach. In order to fit the particular needs of a relatively small public health program, we adapted both scales.

Each level was redefined within the public health framework. We then calculated a combined indicator of risk (Risk Priority Number (RPN)) by multiplying severity X occurrence X detectability. The higher the RPN the more important it was to mitigate the risk. The failures with the six highest scores were prioritized. Some solutions addressed more than one risk. These risks were combined and given a total RPN.

IMPLICATIONS FOR PUBLIC HEALTH PRACTICE AND POLICY

The FMEA process helped to identify potential failures and develop corrective action plans that will best utilize resources to serve as many asthmatics in the city of Boston as possible. The FMEA process can be adapted to a public health systems evaluation framework in order to prioritize areas for improvement. Based on FMEA rankings, next steps include: improving patient education, changing patient contact protocol, improving health care staff education and improving the BEAH website.

Figure 2: FMEA Chart ranked by Severity X Occurrence X Detectability

Action Taken	Failures Addressed	Sev	Occ	Det	S*O*D
Improve Staff Education	Staff must know about housing conditions	3.5	4	2	42
	Staff must be aware of BEAH	3	3	3	27
	Staff must clearly explain program	2	4	3	24
	Staff must address parent concerns	3	2.5	3	22.5
	Site must be registered	3	2	3	18
Total ROC		14.5	15.5	14	133.5
Improve Parent Education	Admin must reach family by phone	2.5	4	1	10
	Adult must be home to let inspector in	2.5	4	1	10
	Parent needs to consent	2.5	3.5	1	8.75
	Client needs to recognize inspection done	2.5	3	1	7.5
	Health Care staff must address parent concerns	3	2.5	3	22.5
	Staff must clearly explain program	2	4	4	24
	Parents must give permission for referral	3	1	1	3
	Total ROC		21	25.5	11
Change Contact Protocol	Adult must be available for inspection	2.5	4	1	10
	Adult must be home to let inspector in	2.5	4	1	10
	Staff must have correct information	1.5	4	1	6
	ISD admin must know about referral	3	2	3	18
Total ROC		15	22	10	90
Changes to Website	Admin must reach family by letter	3	4	3	36
	Admin must reach family by phone	2.5	4	1	10
	Staff must have correct information	1.5	4	1	6
	Adult must be home to let inspector in	2.5	4	1	10
	ISD admin must know about referral	3	2	3	18
	Staff must log in to working system	2	2	1	4
TOTAL ROC		14.5	20	10	84

Figure 3: Proposed Actions

