Quality and Safety Learning Corner

Cause-and-Effect (Fishbone) Diagram: A Tool for Generating and Organizing Quality Improvement Ideas

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LEARNING OBJECTIVES

1. Introduce the concept of a fishbone diagram as a quality improvement tool.
2. Provide useful tips for creating an effective fishbone diagram.
3. Understand how a fishbone diagram can be used in a healthcare setting (case study).

INTRODUCTION

Improvement requires changes to be made. Indeed, one of the questions in the Model for Improvement asks "What change can we make that will result in improvement?[1] Ideas for change are not automatically generated by these tools, but they help analyze problems in detail, and in doing so, potential solutions may be easier to identify. In the healthcare field, a cause-and-effect diagram (fishbone diagram) is a tool that assists in analyzing the root cause of a quality-related problem, such as poor performance or safety incidents. This tool allows the team to focus on the root cause of a given problem instead of the symptoms. When there is more than one root cause, the team may need to address each one with a separate fishbone diagram process.

A fishbone diagram is a visual aid that displays the relationship between the various factors that contribute to a particular effect or problem (i.e., causes and effects) in a way that resembles the bone of a fish (Fig. 1).[2] Another name for the fishbone diagram is an Ishikawa diagram (named after its creator).[3,4] The fishbone diagram and the "five-whys" technique[1,5] are commonly used together to identify the root cause of a problem.

Advantages of the fishbone diagram include:

- Narrows the scope of an investigation to be more manageable or actionable.
- Generates possible causes that we can act on.
- Effective use of time and resources.
- Visualizes the relationships between all possible causes for a focused problem.
- Establishes a shared understanding of the possible causes and solutions.
- Enables logical discussion of the next steps for testing changes.
- Documents which causes are targeted for data collection or have already been verified with data.

FISHBONE DIAGRAM STRUCTURE AND PROCESS

- The "head" of the fishbone diagram is the focused problem.
- The long bones represent the possible main causes (i.e., categories) and how they are related to the problem.

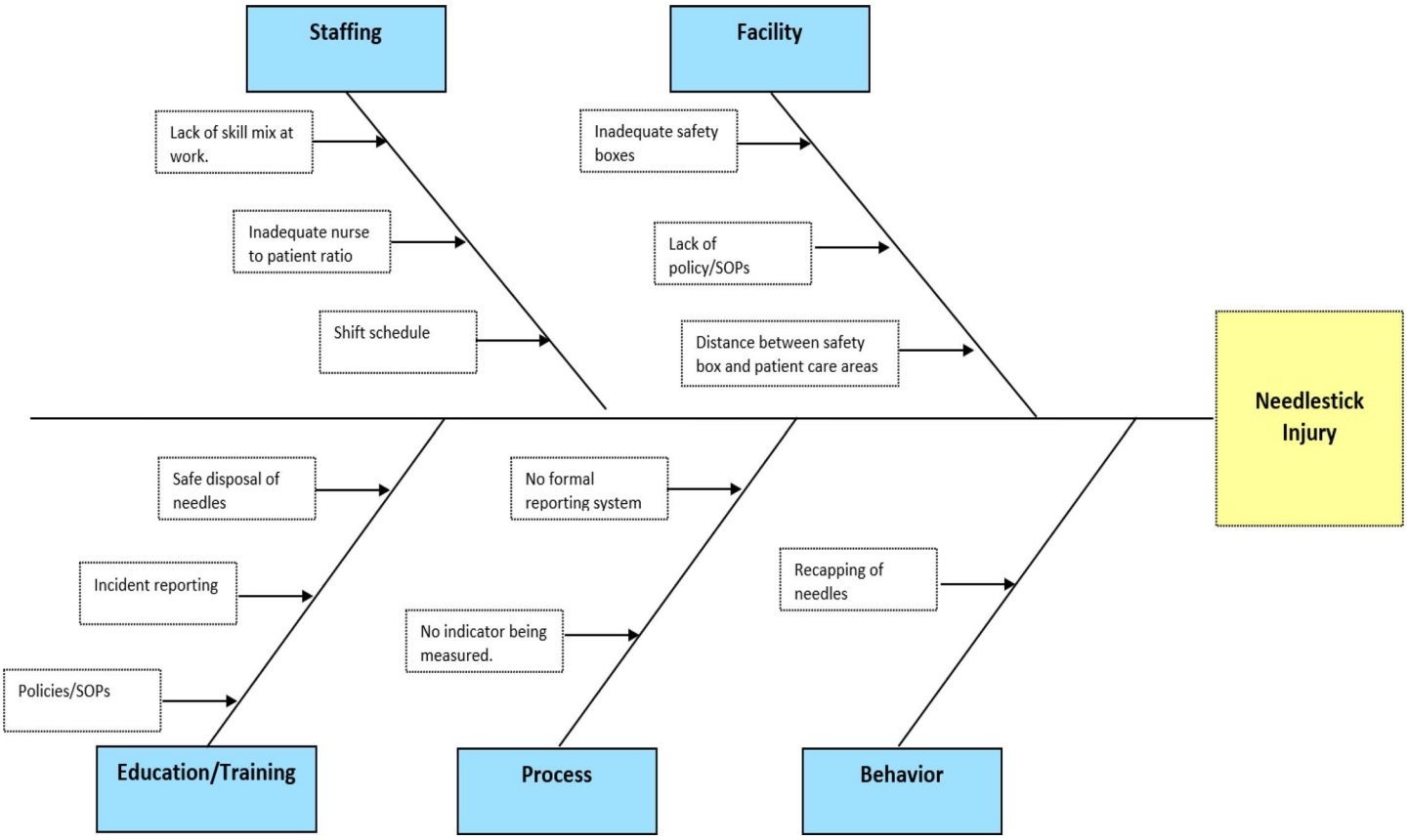

Figure 1. Fishbone or cause-and-effect diagram. Reprinted from Kumah and Forkuo-Minka[6] with permission.

- The short bones represent the possible contributing factors and specific causes and how they are related to the main causes.

The steps for creating a fishbone diagram are listed in Table 1. Useful tips for creating an effective fishbone diagram are provided below.

- Draw the diagram on a large flip chart or dry-erase board.
- Ensure there is enough space between the major categories on the diagram to add minor detailed causes later.
- When brainstorming causes, have team members write each cause on sticky notes and ask everyone in the group to identify one cause. Keep going through the rounds, uncovering more causes, until all ideas are exhausted.
- Encourage all individuals to participate in brainstorming activities and voice their own opinions.
- Organize causes into relevant categories such as materials, methods, equipment, environment, and people.
- A multi-voting technique, like having each team member identify the top three possible root causes, can help identify the most likely root causes of all the ideas generated. Request that every team member put three tally marks or colored sticky dots on the fishbone near the root causes that they think could be addressed. One risk or disadvantage of the use of the fishbone is that it could generate both irrelevant and relevant potential root causes of the problem. This could result in the implementation of change ideas or improvement strategies that might end up not addressing the problem.

CASE STUDY

In 2018 and 2019, Nyaho Medical Centre (NMC) recorded a high number of needlestick injuries among staff.[6] This led to the launch of a campaign to raise awareness of needlestick injury risks, processes for reporting and collecting data, and the initiation of a quality improvement project aimed at reducing needlestick injuries among staff at NMC. A fishbone diagram was developed to identify and visually display the many possible causes (Fig. 1) related to the high incidence of needlestick injuries in the facility. This process helped the facility to test improvement ideas that ultimately led to the reduction of needlestick injuries in NMC from 11 cases in 2018 to 2 cases in 2021.

SUMMARY

When improvement is needed, identifying the underlying factors and causes of problems can be achieved through a structured team process that uses the fishbone diagram for root cause analysis. Understanding the contributing

Table 1. Steps to drawing a fishbone diagram

Step No.	Description
1	Draw a fish, starting with a box on the right-hand side of a landscape page, centered vertically on the page, to represent the "head." In the box, write the problem statement (or effect) that you want to examine.
2	Starting from the middle of the box you made, draw a horizontal line across the page to the left.
3	Come up with a plan and determine the main reasons for the outcome.
4	Create long "fishbones" by drawing diagonal lines above and below the horizontal line, then label each line with a relevant category. Create a box that surrounds each label. In a classic cause-and-effect diagram, the usual categories are materials, methods, equipment, environment, and people.
5	Draw a few short lines extending from each long line to represent contributing factors as they relate to the possible main causes. Ask, why does this happen? List all possible reasons for the problem. If causes are related to multiple categories, they can be repeated.
6	As needed, draw more branch bones from the causes to demonstrate sub-causes. Investigate the causes by asking "why" until you have uncovered sufficient detail. When the cause is sufficiently specific, it is possible to test a change and measure its effects.

factors and main causes of failed processes or systems can aid in the development of measures that can sustain improvement, which is critical in a healthcare setting.

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