INCIDENT MIRROR TECHNIQUE

By Dave Rebbitt

NO UNIVERSAL INVESTIGATION FORMAT EXISTS, and no standard causation model is applied to incident investigations (Grant et al., 2018). Most causation models focus on identifying causes and corrective actions (Lehto & Salvendy, 1991). However, none close the loop by validating the causation findings of whatever model is being used. This creates a serious gap in incident causation.

How can anyone validate a causation analysis and judge the quality of an incident investigation report? Managers often sign off on these as a requirement, but do they know what they are looking for?

Poor incident investigations can lead to more incidents since they do not address gaps or fix problems (Saleh et al., 2010). Good investigations not only can close gaps, but also may identify proactive opportunities to close gaps that have yet to cause an incident (Manuele, 2016). It is a key value proposition of the safety professional.

Managers and others are expected to review and sign-off on incident investigation reports. They are seldom given any real direction on what to look for or how to validate these reports. The review often becomes a signing-off exercise with no real value. Incident investigations are important because they acknowledge that a failure has occurred, and a problem exists somewhere in the system. Many incident investigation reports simply miss the mark (Behm & Powell, 2014; Manuele, 2014).

Incident investigation is a skill that, one hopes, is exercised rarely, adding to the problem. Without a lot of practice, completing good investigations is difficult. For those reviewing reports, the task seems to be to ensure that the form is completed, not that the investigation is effective.

The author has developed a method (a "hack" of sorts) called the incident mirror technique. It is based on the premise that causation models should work as well in reverse as they do normally.

KEY TAKEAWAYS

- Incident investigations are important because they acknowledge that a failure has occurred, and a problem exists somewhere in the system.
- Poor incident investigations can lead to more incidents because they fail to close gaps or fix problems in the system.
- Managers and others who are expected to review incident reports seldom receive direction on how to validate these reports.
- This article discusses the incident mirror technique, a method developed by the author that can be used by managers, safety practitioners and safety committees to quickly validate incident investigations.

Validating reports creates coaching and mentoring opportunities for safety advisors or others conducting investigations. The causation method used is not as important as the outcome. The desired outcome is a valid and effective report. Safety practitioners also need a quick way to "gut check" or validate reports before they are finalized and sent on for review.

This method came about because the author was asked by managers how they could judge whether an incident investigation report was any good. Good leaders want a thorough investigation and need an understanding of causation (Krause et al., 2010), but applying that to reports is something of a different exercise. As a senior safety manager, the author also had to review a lot of reports and found an effective way to evaluate them quickly.

Most managers are expected to review and comment on reports, but what are they looking for? Managers do not see a lot of investigations and receive little training, so maintaining expertise is a bit much to ask. They need a simple way to validate reports. From a basic perspective, every incident report should do a few things.

1. Adequately describe the incident. Can a person who is not familiar with the workplace understand what happened by reading the description of the incident? Could someone read the incident report years from now and understand what happened? A good description has several attributes:
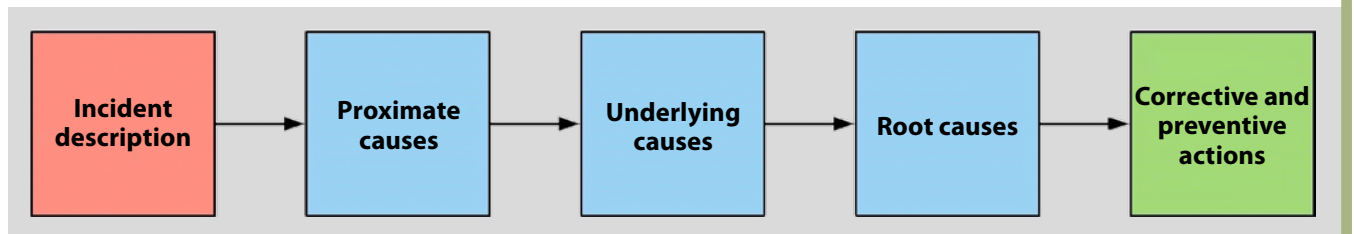
- It contains only facts, no supposition or guesswork.
- It is written in clear language and uses no jargon or acronyms that are not explained.
- It avoids breathless superlatives and third-person narrative, such as "Safety responded rapidly arriving to take immediate control. Safety then analyzed the situation and prioritized and interviewed witnesses."

2. Address causation. Is there some causation model at work or identified? Every incident report should have a section on causation. It should align with a consistent model used by the company. This can form some sort of checklist for categories or identify a tool such as the popular systematic cause analysis technique (SCAT) chart based on Bird's loss causation model (Bird et al., 2003). Figure 1 shows a typical causation model.
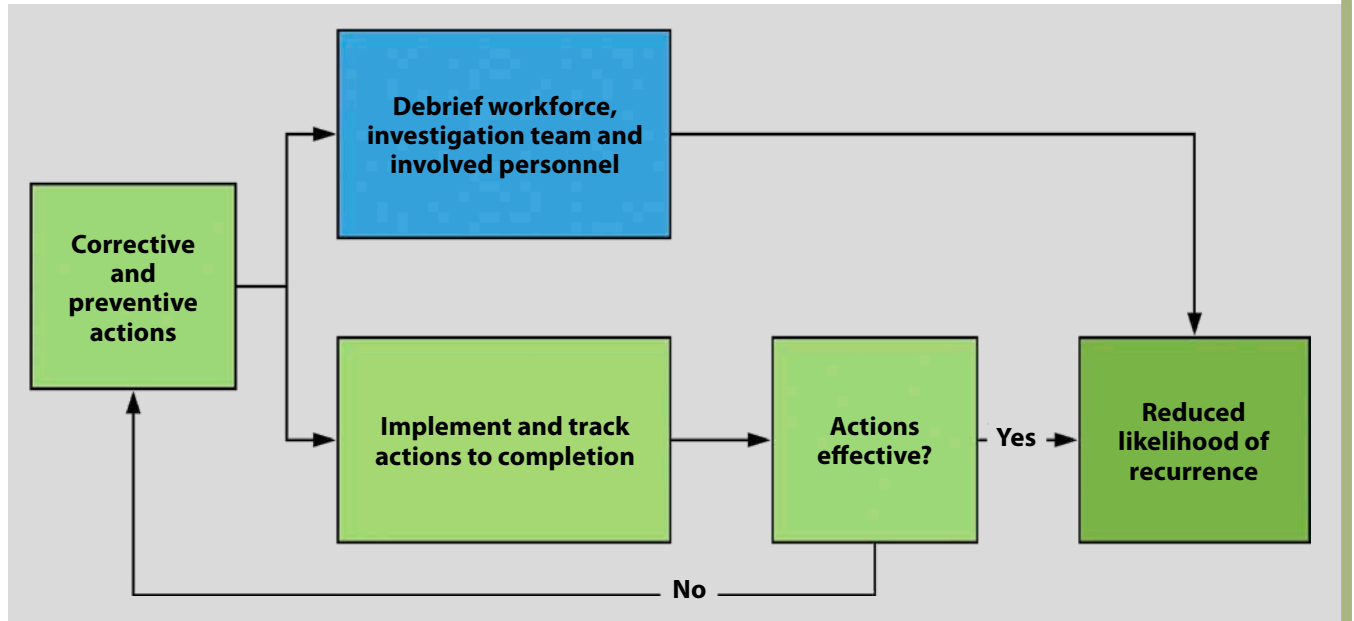
Anyone conducting an investigation must use the causation model that the company has selected for the sake of consistency. There are many, but they generally operate on immediate or proximate causes, with some underlying causes (Lehto & Salvendy, 1991).

3. Include a method for making and tracking recommendations. Every incident report should include a method for identifying

FIGURE 1
TYPICAL CAUSATION MODEL

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Incident         Proximate        Underlying        Root causes      Corrective and
description  →   causes       →   causes        →                →  preventive
                                                                     actions
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FIGURE 2
TYPICAL CORRECTIVE ACTION & FOLLOW-UP

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                    ┌──────────────────────────┐
                    │  Debrief workforce,      │
              ┌────→│  investigation team and  │──────────────────────────┐
              │     │  involved personnel      │                           │
              │     └──────────────────────────┘                           ↓
┌──────────┐  │                                                      ┌──────────────┐
│Corrective│  │                                                      │  Reduced     │
│   and    │──┤                                         ┌──Yes──────→│ likelihood of│
│preventive│  │                                         │            │ recurrence   │
│ actions  │  │     ┌──────────────────┐   ┌──────────┐ │            └──────────────┘
└──────────┘  └────→│ Implement and    │──→│ Actions  │─┘
     ↑              │ track actions    │   │effective?│
     │              │ to completion    │   └──────────┘
     │              └──────────────────┘        │
     └──────────────────────No─────────────────┘
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recommendations and assigning them to a specific person for action. A target date should be assigned for completion of the recommended preventive or corrective action. Recommendations must be tracked to completion. Actions should also be evaluated for effectiveness. Figure 2 shows a typical corrective action and follow-up process.

Using the Incident Mirror Technique
Basic Report
Now that we know what a basic report looks like, we can move on to the incident mirror technique. When completing an investigation or reviewing one, the incident mirror technique helps quickly validate any investigation. It can also be used to measure report quality to raise the bar.

As an example, let's take a basic incident that everyone would understand.

Incident description: The employee was walking down the hallway and slipped on a wet floor.

Proximate causes:
•Floor was wet.
•Employee was not paying attention.

Underlying causes:
•Cleaning activity was conducted, but no warning sign placed.
•The employee did not recognize the hazard.
•The employee was in a hurry.

Root causes:
•Cleaner's sign was stolen; no sign was available.
•Cleaner did not report loss of sign.
•The employee had a false sense of urgency.

Corrective actions:
•Review requirements for sign placement with cleaner.
•Provide a new sign to the cleaner.
•Remind the employee to reduce walking pace and remain alert.
•Provide results of the investigation to staff in the area.

If we lay the incident out graphically, we can see causes (Figure 3, p. 40). Although this is not a great incident report, it certainly seems to represent what a lot of people see.

Applying the Technique
We can quickly apply the incident mirror technique to this investigation. The first thing we evaluate is the description. In this case, it is basic. We can get a basic idea of what happened. That could pass muster. It might be nice to know more information, but that may be captured on other parts of the investigation form.

In using the incident mirror technique, we read the incident report backward, starting with the corrective actions (Figure 4, p. 40).

The incident mirror technique looks at the corrective actions, as these are intended to address the root causes identified. First, we must determine whether the report found the root cause. That leads to a simple exercise.

A root or system cause is almost always described by a few specific parameters (Manuele, 2016):
•It is a factor controlled by management, as most causation models trace the accountability back to the company.
•It is not directly related to the person involved in the incident.
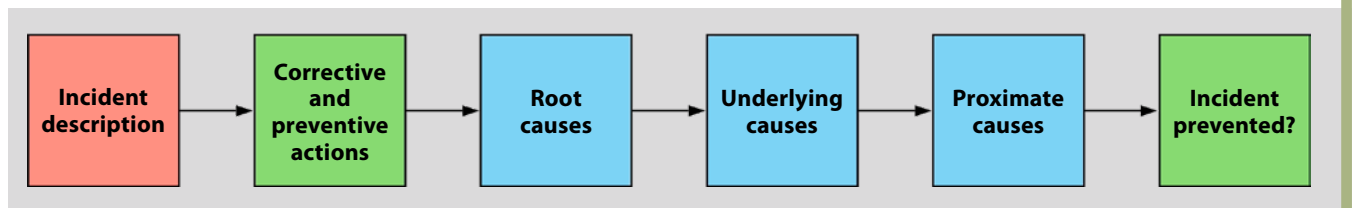•It is a gap in the system.
Examples of root cause include:
•a process that is in place but not operating correctly,
•a requirement that is not being enforced,

FIGURE 3
EXAMPLE INCIDENT GRAPHIC
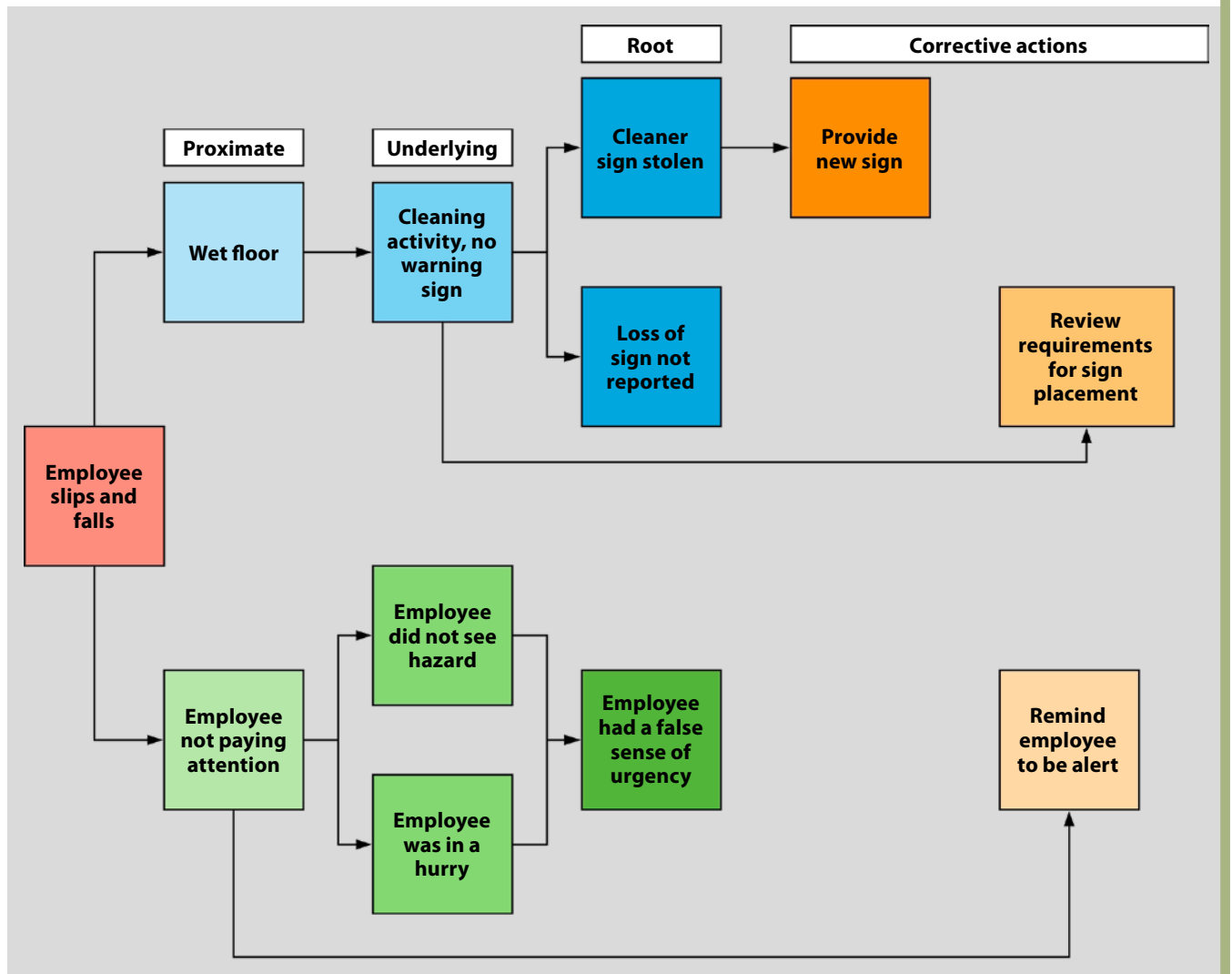
FIGURE 4
INCIDENT MIRROR TECHNIQUE ORDER OF REVIEW

•a flawed process like poor training, or
•lack of a clear process.

Reviewing the Proposed Actions

In applying the incident mirror technique, we read the description and immediately flip to the corrective actions. It is a simple matter to analyze each one.

1. Review requirements for sign placement with cleaner. Does this assume that the cleaner did not know about the requirement? This action deals directly with the employee and implies an error. While an error may have occurred, no evidence exists that the cleaner did not know they were required to put up a sign. This is not a valid corrective action.

2. Provide new sign to cleaner. A new sign is needed, but why was no replacement available or obtained? Are any replacement signs available? Do we assume that the cleaner did not know

they needed a replacement, or that they had not asked for one? Again, this is not a valid corrective action.

3. Remind employee to reduce walking pace and remain alert. Again, we see a focus on an employee, not the system. Will speaking to the person change their behavior when they feel stress? Unlikely. Telling someone to have better awareness is almost like telling someone to remember to breathe. It is condescending, at best, and implies that the employee caused the incident. This is not a valid corrective action.

4. Provide results of the investigation to staff in the area. While this action may be needed, it should be done in any case. It may be prudent to track this on the incident report, but this really does little to correct any of the identified causes. This is really a valid corrective action in relation to what has occurred.

In this case, none of the actions would potentially eliminate any of the identified root causes. This report needs
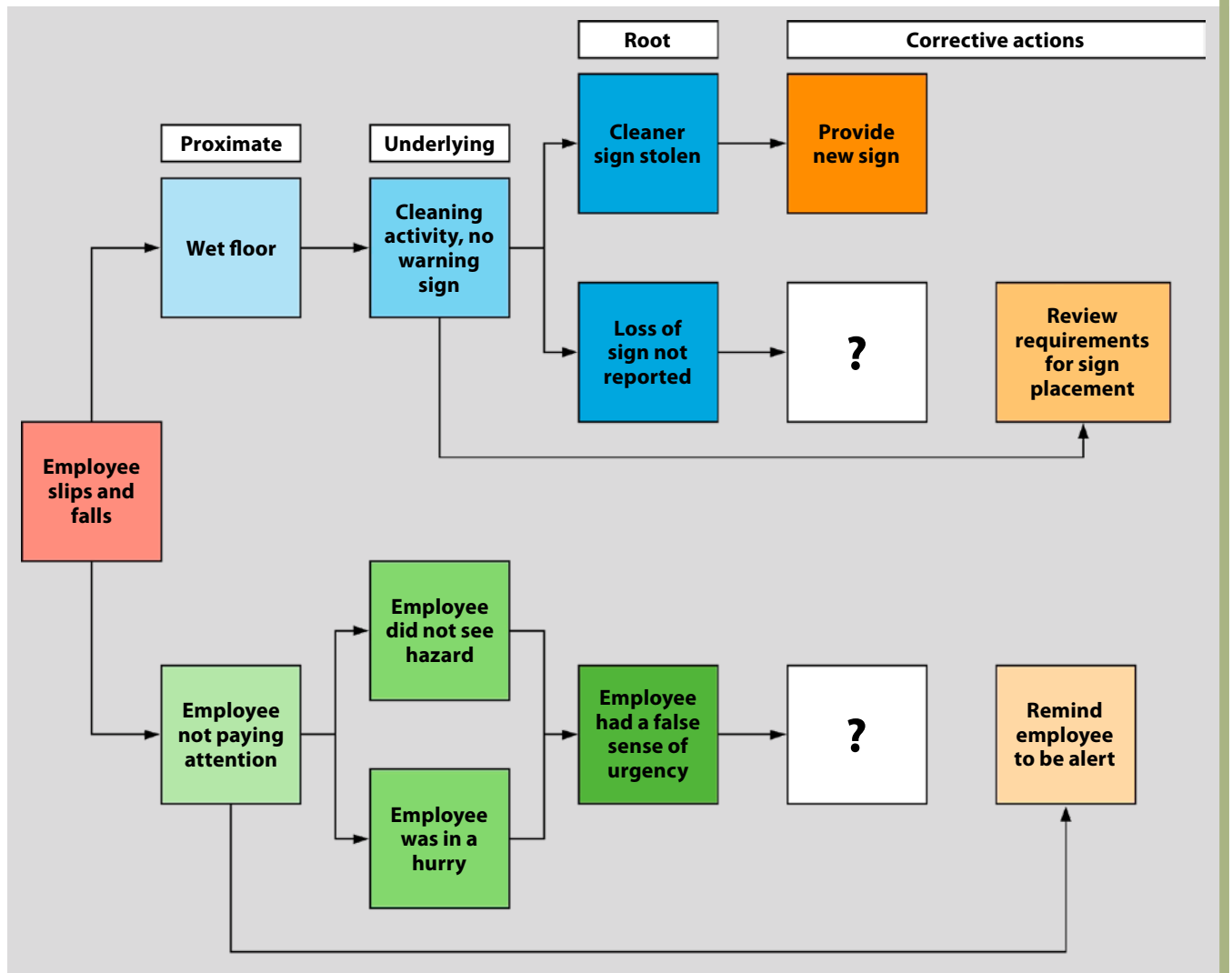
more work and should be sent back. After a review of the corrective actions, assuming they seem valid, a second test should be performed. In looking at the corrective actions, we examine whether those actions would potentially eliminate the root causes.

Validating Causes

If the corrective actions are found to be valid, then it is a simple matter to determine whether they actually extinguish the identified root causes.

Root causes may be connected to a single or several causal chains. This can be determined in a good incident report because the causes and their selection are explained at each stage. In some investigations, causes are selected from checkboxes. Simply checking a box or a term is never enough. Unless there is some explanation linking these selected causes to the preceding cause or incident, this is a hallmark of a poor report.

Selecting an underlying cause such as "trying to save time" is only slightly descriptive. It must be explained and linked to proximate cause. For example:

The worker indicated he was rushing to complete the task because his supervisor had led him to believe the task was urgent. He was not paying attention, and so did not see the wet floor.

This provides the reasoning for the identified cause and links it back to the proximate cause of the worker being distracted.

Extinguishing the Causal Chain

Starting with a valid corrective action, the question is whether that action would extinguish the root cause. As you work back through the causal chain, the simple question then becomes, With the removal of this cause, would the next cause be extinguished? If the root cause is extinguished, then it should extinguish the preceding level of causes.

In this incident, the investigation report has identified several causal chains. After reviewing the incident with the incident mirror technique, we could draw the incident out again (Figure 5).

There are two causal chains, and the incident report certainly seems to start off well. For example, the wet floor sign was not placed, and that is due to the sign being stolen and the loss of the sign not reported (required to get a new sign).

In the "wet floor" causal chain, it becomes plain that the failure to report is not addressed and that the action item relates to the underlying cause, but the root cause was never truly identified or addressed.

In the second causal chain, we see that, again, the proximate causes are identified, but the causal chain ends with the underlying cause. The corrective action only deals with the proximate cause. A root cause is not truly identified.

The term "root cause" is used here, but it is just a term. There may be more than three layers of causation. However, reason must prevail, and causes can only be identified insofar as the company is able to act upon them.

In both of these causal chains, there is clearly a more complex underlying set of causes that have been missed in this cursory report.

FIGURE 6
INCIDENT MIRROR TECHNIQUE FLOWCHART
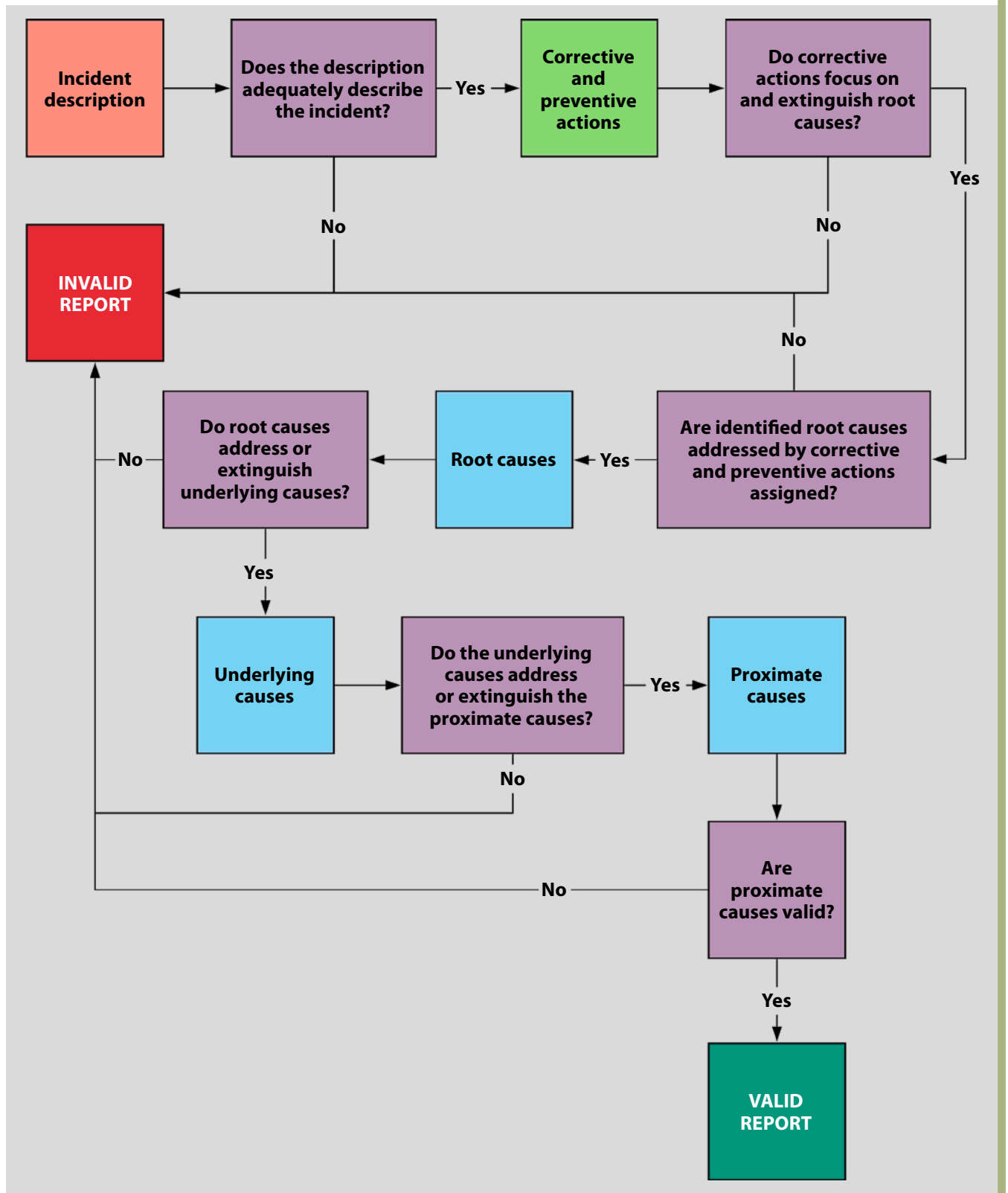
The incident mirror technique is simply about asking some of the right questions to validate a report quickly. It is not entirely infallible; nothing is. The flowchart in Figure 6 summarizes the incident mirror technique.
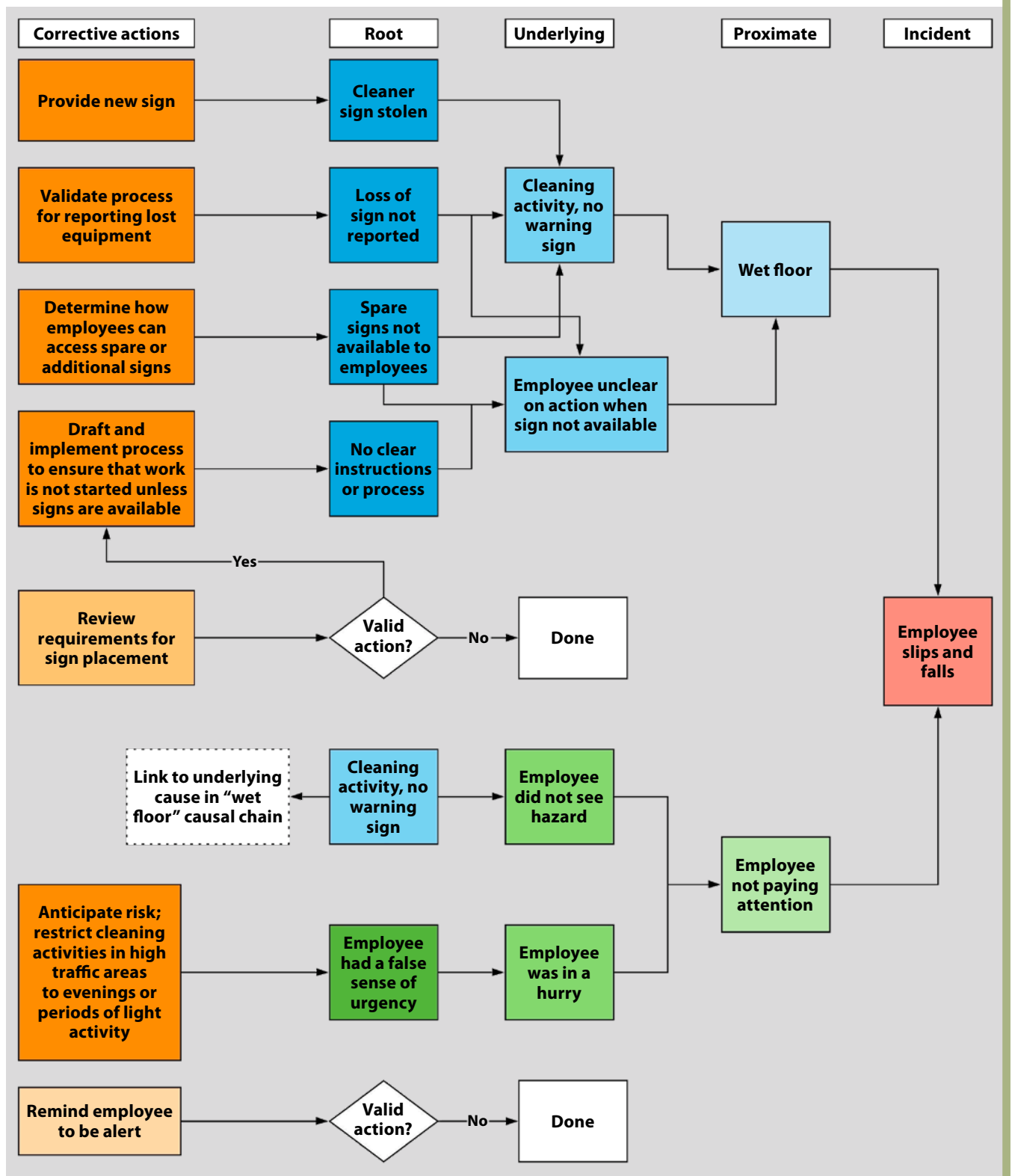
Gaps Are Identified
This simple incident seems straightforward, but we have shown that gaps exist in this report. The flowchart in Figure 6

may seem complex, but it is simply asking the same questions moving back through the incident report to ensure that a causal chain is extinguished by the recommendations. By digging deeper with this simple tool, we can see that some causes were not identified. These causes become much more obvious when we use the incident mirror technique.

If we look at the first causal chain involving the wet floor, we can see that no spare signs may be available and perhaps that

FIGURE 7
UPDATED EXAMPLE INCIDENT GRAPHIC

Corrective actions	Root	Underlying	Proximate	Incident

Corrective actions: Provide new sign → **Root:** Cleaner sign stolen

Corrective actions: Validate process for reporting lost equipment → **Root:** Loss of sign not reported

Corrective actions: Determine how employees can access spare or additional signs → **Root:** Spare signs not available to employees

Corrective actions: Draft and implement process to ensure that work is not started unless signs are available → **Root:** No clear instructions or process

Underlying: Cleaning activity, no warning sign; Employee unclear on action when sign not available

Proximate: Wet floor

Incident: Employee slips and falls

Corrective actions: Review requirements for sign placement; Valid action? — No → Done / Yes ↑

Underlying: Cleaning activity, no warning sign → Link to underlying cause in "wet floor" causal chain; Employee did not see hazard

Corrective actions: Anticipate risk; restrict cleaning activities in high traffic areas to evenings or periods of light activity → **Root:** Employee had a false sense of urgency → Employee was in a hurry → Employee not paying attention

Corrective actions: Remind employee to be alert; Valid action? — No → Done

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no process is in place to replace them quickly, or employees did not have access to spare signs or did not have clear instructions on what they must do if no signs are available or if they run out.

If we expect employees to report the loss of equipment, is a process in place for that? Was the supervisor aware of the process? If there is no way to warn people moving through the area, should the activity be undertaken at all?

Some interesting questions arise when we look at the second causal chain, "Employee not paying attention." Can we reason-ably expect that employees will not be distracted? Shouldn't the employer be aware that this is a risk? Is it necessary to conduct cleaning work during office hours?

Perhaps the underlying or root causes here are more about when the work should take place and a clear understanding of what should happen when specified safety precautions cannot be taken. Instead, we see some causes and corrective actions that would ulti-mately be ineffective and are targeted directly at employees instead of the problems or gaps that allowed the incident to occur.

Filling In the Blanks

We can fill in the blanks, answering some of the questions that have arisen during our review of this incident. On the surface, it looks like a standard report. As we used the incident mirror technique, clear gaps were identified. We also identified that the causal chains here are interlinked. Instead of simply providing a sign to the cleaner, we must review the process for reporting lost equipment, particularly equipment that controls against loss. It would also address the ability of an employee to access the replacement equipment without having to find a supervisor to obtain some special access to a supply locker.

A critical shortcoming is identified around our processes to ensure that employees clearly understand what process they should follow if they find that they cannot safely perform an assigned task. Perhaps because employees are unable to access a replacement sign, they were unclear about what they should do in such cases. In this case, the cleaner felt it was important to do the cleaning and perceived the risk as low, so the employee chose to do so without the sign.

The causal chain around the employee not paying attention and thereby slipping is an interesting one. Obviously, the company should expect that employees will travel in this area distracted. That is simply human nature. If the employer knows this, then the company should take measures to ensure that hazards do not randomly arise that people are unlikely to notice. This would lead to a corrective action exploring whether it was appropriate for this activity to be conducted in this place and at this time.

If it is not possible to change the time of cleaning activity, then such activity should take into account that people may be distracted in this area and require something more substantial than a simple wet floor sign. It may be that the employer will see this as an acceptable or tolerable level of risk.

The updated graphical representation of the incident (Figure 7, p. 43) clearly outlines the causation chains. In a more complex investigation, things could be a lot more complicated as many causal chains might exist. However, the method remains the same. By challenging the recommendations first and determining whether they begin to extinguish the identified causal chains, one can quickly validate the incident investigation report.

Reviewing Investigations

Reviewing investigations on an annual basis is good practice. The incident mirror technique can allow a group or safety committee to review many reports quickly and efficiently. Safety practitioners and committees can use it to validate reports and look for gaps or other factors that have not been addressed. An incident review can lead to further inquiry and better corrective actions. In some cases, corrective or preventive actions do not turn out to be as effective as envisioned, and additional action may be warranted.

Some companies periodically review investigations to ensure that the quality of the investigation report is of a uniform and high standard. The incident mirror technique also provides a template for an incident investigation quality scoring system. The aspects of a report can be scored to provide an overall score.

Most causation models are generic in application with the purposes of identifying causes (Lehto & Salvendy, 1991; Salmon et al., 2020). The incident mirror technique will work best with what are described as "linear causation models" or logical progression models like Reason's Swiss cheese model. It would also be useful with what are sometimes called "non-linear models" such a Tripod Beta or STAMP (Fu et al., 2020).

As with all tools, there is some dependence on the skill and experience of the user, as there is some subjectivity to causation analysis and results can be arbitrary (Saleh et al., 2010).

Conclusion

The incident mirror technique is about holding a mirror to investigation reports, ensuring that they work in both directions. It provides a quick, effective way for anyone to validate an investigation report with limited expertise. No matter what causation model a company uses, the incident mirror technique would allow the investigation report to be validated quickly.

Clearly, incident investigations are something organizations must get right. Poor investigations do not fix the issues that would prevent a recurrence. Poor investigation reports are nothing more than an exercise in complacency. Good incident investigations are valuable to the organization in that they allow the company to proactively close gaps in the system. By critically reviewing the logic of the report in reverse, gaps in the investigation are easily identified. If a report cannot withstand this simple scrutiny, then it needs work. In asking the right questions, we can improve the quality and engagement in our incident investigations. **PSJ**

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