

Use of AI Acknowledgement

I acknowledge the use of Quillbot (<https://quillbot.com/ai-chat>) from 17 July 2026 to 20 August 2026 to check my work. I used the prompt(s):

1. Please give suggestions to improve the fluency and readability of the following sentences.
2. Please check if there are any grammar mistakes in the following sentences.
3. Please connect these sentences into a fluent paragraph.
4. Please check if the following paragraph structures are logical.

I confirm that I have not presented any AI generated text as my own work. I confirm I have copies of my drafts, notes, and other resources I used before, and after the use of AI tools which I may be asked to provide in evidence.

I acknowledge the use of Consensus (<https://consensus.app/>) from 17 July 2026 to 20 August 2026 to support my work. I used the prompt(s):

1. Please provide me with materials on prospective memory retrieval.
2. Please provide me with materials on the multi-process model of prospective memory retrieval
3. Please provide research evidences on the topic of workload, attentional demand, and hand hygiene lapses in healthcare.
4. Are the findings of the following journal articles converging?
5. Please provide research articles that are similar or related to the following.

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CASE REPORT

BACKGROUND TO THE REPORT

The purpose of this report is to discuss a hypothetical patient-safety incident by Glynafonshire Health Board, where poor hand hygiene among district nurses led to eight patients developing a serious infection, one of whom died. All of the nurses involved had been trained in handwashing policy and had been assessed in both a theoretical and practical test. According to the health board's official report, there were increased numbers of cases in the area, creating a staffing crisis which required nurses to work overtime and double the number of patients per shift. Due to the high workload, nurses reported having to rush, and some failed to complete hand hygiene procedures before and after touching a patient. Since the nurses were fully aware of the policy, this appears to be a prospective memory failure. To explain, the nurses forgot to remember to carry out hand hygiene practices due to heavy workload. The Multi-Process Model of prospective memory retrieval by McDaniel and Einstein (2000) will be used in the current report to analyse the incident and provide recommendations.

THE MULTI-PROCESS MODEL OF PROSPECTIVE MEMORY RETRIEVAL

Prospective memory (PM) is the memory in which an individual remembers to take a planned action at a specific future time without relying on external reminders (American Psychological Association, n.d.). PM tasks could be divided into time-based and event-based. The former are intentions triggered by a specific time, and the latter are actions performed in response to environmental cues (Blondelle et al., 2022), such as sanitizing hands before entering a patient's front door. These tasks involve individuals encoding an intention, engaging in an ongoing unrelated task, and performing the planned action later when a specific cue appears (Chen et al., 2022).

The most comprehensive PM retrieval model proposed is the Multi-Process Model (MPM) developed by McDaniel and Einstein (2000). The model posits that PM retrieval can take place by two qualitatively different processes. The first is strategic monitoring, an active process that requires attentional resources and has limited capacity. It involves regularly searching the environment for the target cue, which affects performance on the ongoing task because it utilizes the same limited pool of cognitive resources (Einstein et al., 2005; Smith, 2003). The second process is spontaneous/reflexive retrieval, an automatic and effortless retrieval from the long-term memory. It usually happens when the cue is sufficiently distinctive or salient. According to the MPM, which process is used is determined by the nature of the cue and task. For example, if the cue is focal, it is easier to process and more likely to lead to low-cost spontaneous retrieval. In contrast, if the cue is non-focal, it is less noticeable and requires effortful monitoring in order to be noticed (McDaniel et al., 2004).

There is a considerable amount of research supporting the claim. Smith (2003) conducted a study within the framework of the closely related theory of preparatory attentional and memory, showed that maintaining a PM intention resulted in decreased performance on a concurrent lexical decision task. That is, the researchers discovered that successful PM performance comes with a cognitive cost to the ongoing task. To add on to those findings, Einstein et al. (2005) found that costs to an ongoing task only occur when the PM cue is non-focal and therefore requires monitoring, but not when it is highly salient and spontaneous retrieval is possible. This finding provides a clear illustration of the two-route distinction that the MPM proposed. Considered as a whole, this body

of work indicates that remembering to carry out a routine behavior is not an either/or capability. Rather, it is very sensitive to the amount of spare attentional capacity and also to the arrangements of the environment for signaling or cuing the planned behavior.

HOW DOES THE THEORY RELATE TO THE CASE STUDY

Based on the MPM, practicing hand hygiene before and after entering/exiting patient premises is a non-focal PM task which should be performed alongside the ongoing task of providing nursing care. The cue (front door of a patient's home) is not as readily available and noticeable as the wall-mounted hand sanitizer dispensers in a hospital ward. Detecting such non-focal cues relies heavily on strategic, resource-limited monitoring (McDaniel et al., 2004). So, it depends on individual circumstances and can be easily overlooked in favor of a more demanding task of assessing or treating a patient.

Months before the incident, there was a staff shortage that forced nurses to work back- to-back shifts and carry double their regular workload. Now, as explained earlier, both prolonged time-on-task and increased number of simultaneous care demands take place within the same limited working memory/executive attention system that PM tasks rely on (Smith, 2003; Einstein et al., 2005). That shared resource gets gradually depleted because of the unusually large volume of activity. Therefore, it is not surprising that the nurses' ability to consistently monitor the hand hygiene cue would decrease, even if their knowledge of and their intentions to follow the policy remained the same. This is consistent with the empirical trend found by Pittet et al., (1999) and later

by Chang et al., (2022), who demonstrated that hand hygiene compliance in a big multicenter dataset held steady until the count of hand hygiene opportunities exceeded roughly 30 per hour. After that threshold, compliance dropped sharply, showing that monitoring resource will get depleted over time due to its limited capacity.

All the nurses involved were subjected to written and practical skill assessments beforehand. Moreover, the health board confirmed that all of them are skilled and experienced in their job. Thus, concluding that the error was due to insufficient training would not be fair. What seemed to have failed under unusually heavy mental demands is the specific PM component. That is the part where a person has to remember to turn a stored intention into action at the right moment, before their already busy monitoring process has enough free attention to notice the cue. Seen this way, the problem starts to look less like intentional disregard or simple carelessness. Instead, it looks more like a predictable result of pushing an already overloaded cognitive system to keep perform steadily under long periods of high attentional demand.

WORKLOAD, ATTENTIONAL DEMAND, AND HAND HYGIENE LAPSES IN HEALTHCARE SETTINGS

The link between workload and attentional demands with hand hygiene non-compliance is supported by the following practical research. First, Chang et al., (2021) analyzed observational data from the multicenter STAR*ICU study and found that hand hygiene compliance was fairly stable with lower to moderate workloads, but decreased significantly if the number of opportunities was above 30 per hour. That is perhaps the largest-scale example that shows how compliance is something that deteriorates when monitoring demand gets too high. Next, the earlier, smaller study by Pittet et al. (1999) also reported an inverse association between hand hygiene compliance and the number of hand hygiene opportunities per hour. Later, Erasmus et al. (2010) conducted a systematic review of 96 hospital studies, which found that understaffing and increased workload were common factors of poor compliance that were amenable to change.

To counter this issue, the World Health Organization developed the "My Five Moments for Hand Hygiene" framework with a user-centered approach. Its main goal was to make the reminders for hand hygiene more visible and noticeable during everyday clinical work, rather than relying on healthcare workers to remember them on their own (Sax et al., 2007). This design philosophy supports the MPM's key principle that well-designed and clearly presented prompts make it easier for people to act quickly and with little mental effort. On the other hand, cues that are not as clear or obvious, like an unmarked entryway in a patient's home, require much more effort and attention to notice and respond to.

SUGGESTIONS FOR NEW PROCEDURES BASED ON THE THEORY

The four recommendations below are built on the MPM described earlier. First, the hand hygiene cue itself should be made focal. Instead of relying on something that differs in each patient's house, nurses could be given a small hand sanitizer that could be attached to their uniform, lanyard or equipment bag. In this way, the cue to sanitize follows the nurse and will be perceptually available at the beginning of each visit. This aligns with the "focality principle" of the MPM (McDaniel et al., 2004). The task then shifts from effortful monitoring to low-cost, reflexive retrieval which should do much better in the high workload situation described in the case.

Second, training and refresher sessions ought to involve implementation intentions, which are specific if-then plans rehearsed beforehand. To illustrate, nurses may plan: If I am about to enter a patient's premise, then I will use hand sanitizer; and If I am about to leave a patient's house, then I will use hand sanitizer before I touch my bag or car door handle. These plans set a firm link between the intended action and the situation in which one intends to do it (Gollwitzer, 1999). In addition, Rummel et al. (2012) discovered that these plans enhance the spontaneous recollection of the intent, which in turn enhances PM performance. Furthermore, McDaniel et al. (2008) demonstrated that implementation intentions benefit PM performance especially when attentional demands are high, which is just the type of workload presented in this case study. To summarize, when memory performance needs to stand the test of prolonged attentional demands, it is better to use implementation intentions than straightforward standard instructions.

Thirdly, inspired by the WHO's 'My Five Moments' framework, the community visit workflow might be optimized through standardized external prompts such as checklists or gentle reminders planted into nurses' mobile phones. These tailored support tools have the potential to offer cognitive offloading chances, which allow nurses to be less reliant on internal monitoring. Besides that, the heavy workload highlighted in the case study should be identified as a key issue to tackle. Chang et al. (2022) stressed that even if the staff are capable and well-intentioned, compliance with care tasks will only be maintained if care opportunities per hour stop rising.

So, even though efforts to redesign cues and conduct training may increase compliance, they cannot replace adequate staffing. Priority should be given to reducing caseloads and ensuring safer shift patterns.

These suggestions vary in terms of their ethical impact to nursing practice. The portable dispenser idea and the implementation intention training are low-burden and low-cost options. They also respect nurses' professional autonomy, in the sense that they are essentially a reinforcement of nurses' intentions and skills. Ethical issues lie with the mobile device prompting approach. For example, a system to monitor missed hand hygiene opportunities could feel like secret surveillance to healthcare workers. This can undermine the trust between frontline staff and management. If such monitoring is coupled with punishment, there is a real danger of unfairly blaming individuals, which only adds to the existing problems. That is why monitoring technologies must be implemented transparently, and all staffs involved have to go through briefing beforehand. These systems also need to be kept completely separate from disciplinary measures, so that they align with a "just culture" approach to patient safety, a philosophy that prioritizes examining systemic issues before looking at individual actions (Murray & Merchant, 2023). Most importantly, the health board has a moral duty to address the root causes of incidents, rather than relying only on cognitive and behavioral strategies to manage stressed nurses. In particular, they must acknowledge that the incident was caused by understaffing.

EVALUATION AND CRITIQUE OF THEORY

The use of the MPM has been supported by well-controlled experimental data, such as that of McDaniel and Einstein (2000), Einstein et al. (2005), and Smith (2003), hence it is an effective explanatory model. It also provides testable predictions that had been confirmed. For instance, the costs of a task would only appear when the PM cue is non-focal. Here, that concept helps to account for the situation presented in the current case study, where a capable work force with excellent assessment results failed to perform consistently when workload rises. The theory assumes that those failures are caused by a resource-limited retrieval process, meaning they are not due to lack of knowledge or lack of motivation. Personally, this explanation feels more appropriate than those that simply blame a training deficit.

However, there are some drawbacks. Much of the supporting evidence comes from brief, artificial laboratory situations with retention intervals of minutes rather than the full hours of a normal work shift (Einstein & McDaniel, 1990; Marsh et al., 2006; McDaniel & Einstein, 2000). Apart from this, some studies have used more realistic and immersive methods and have found that the difference between actively monitoring for information and spontaneously accessing it is not as clear-cut or as powerful when applied to extended, emotionally intense real-life situations as it might seem in theory (Dismukes, 2012; Kourtesis & MacPherson, 2021; Möschl et al., 2017; Scullin et al., 2013). So naturally a sensible inquiry can be raised: how much of those ideas derived from laboratories can be extended to a district nurse working a 12-hour shift under prolonged stress?

More significantly for the present case, the theory of PM can only explain the proximal-level cognitive failure, which is the failure to execute the intended action immediately. It cannot quite explain distal organizational issues like chronic understaffing and rote design. Broader research on hand hygiene compliance has found, apart from cognitive load, other aspects including communication openness, perceived peer performance and work place stress also predict compliance (Alshagrawi & Alhodaithy, 2024; Davies et al., 2025; Sands & Aunger, 2020). The systematic review by Erasmus et al. (2010) also suggests a large, interacting set of determinants rather than a single cognitive bottleneck. Therefore, if used on its own, PM theory may only offer a partial explanation for what is clearly a much more complex and multi-layered issue.

Another problem is that this theory cannot be used to draw broad conclusions. PM theory was developed to explain why people sometimes forget things unintentionally. But when researchers look at the bigger picture of human error, they note that not all memory lapses are the same. Sometimes, people actually know what they are doing and deliberately step away from their usual routine, whether it is a mental or physical one, especially when they are under a lot of pressure (Reason, 1990). From the case material alone, it is hard to tell whether this failure to follow protocol was indeed a case of forgetting (a genuine PM slip) or more of a reluctant, conscious shortcut taken in the heat of the moment. The two situations would produce very different solutions.

Finally, because PM is focused on individual mental processes, it can be misused since the responsibility and solutions are placed solely on nurses' attention and memory. So, instead of treating it as the full story behind what went wrong, it should be regarded as one of the credible and evidence-based approaches that can partially explain the case.

CONCLUSION AND RECOMMENDATIONS

This report applied the Multi-Process Model (MPM) of prospective memory (PM) by McDaniel & Einstein (2000) to the given case study. The basic idea was that handwashing in the context of the case study was a non-focal, event-based PM task. In other words, handwashing was an action that had to be performed by nurses intentionally and as a separate task while being occupied with their primary task of providing care to patients. In this case, the addition of working overtime and double shifts, as mentioned in the case study, would have competed for the nurses' attentional resources, thus reducing their capacity to engage in PM monitoring for hand hygiene compliance cues. This conclusion is consistent with the findings by Chang et al. (2022) and Pittet et al. (1999), who found that increased workload reduces healthcare workers' adherence to hand hygiene protocols.

In this regard, it was recommended to make hand hygiene cues more perceptually salient and self-carried, implement implementation intentions in training, and most importantly, address the staffing issues. It is recommended to implement these measures together, as redesigning cues and cognitive training without tackling the increasing workload would not be sustainable.

Meanwhile, the critiques raised earlier cautions against treating PM theory as the complete explanation. Although it does well in postulating cognitive processes, it ignores deeper organizational issues like staffing levels, how shifts were structured, and possibly even deliberate underperformance due to pressure. Hence, any modifications based on this analysis should be part of a larger, non-punitive safety framework that is systems-focused. Otherwise, errors caused by resource restrictions may be incorrectly attributed to nursing staff.

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