

## Interruptions to Clinical Work: How Frequent Is Too Frequent?

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Given the stresses and cognitive burden<sup>1-5</sup> imposed by constant interruptions, it is not surprising that one of the latest developments in mobile phone technology is a sophisticated “interruption” filter. This filter allows us to screen out all but specified priority callers while we concentrate on the job at hand. Meanwhile, our phones will let everyone else know we are busy. Once we signal we are free, our phones will remind us to deal with missed calls and messages. This is an elegant technologic solution to a common modern-day problem: A solid body of largely experimental evidence links interruptions to critical cognitive failures.

These cognitive failures include lapses in attention or memory, impaired decision-making, increased stress and anxiety, and higher error rates. Interrupting someone midtask can lead to short-term memory disruption resulting in tasks being left unfinished, or they may be hurriedly finished off with corners cut to make up for lost time.<sup>1,4,6</sup> In the aviation industry, interruptions have been associated with major negative events<sup>7</sup> and pose a significant hazard for task errors, so much so that, in 1981, the US Federal Aviation Authority mandated the “Sterile Cockpit,” now standard operating procedure on commercial airlines. This means a series of prohibitions come into force in cockpits during critical safety tasks to isolate air crew from interruptions. These prohibitions include a ban on nonessential conversations.

How does this well-established relationship between interruptions and diminished performance and errors play out in busy clinical settings where numerous interruptions to doctors and other staff occur and may be essential to delivery of critical care on time? It is reasonably straightforward to quantify the rate at which interruptions occur using standardized tools and definitions.<sup>8-10</sup> However, it is considerably more challenging to understand and measure their effect and to identify classes of interruptions, which might be successfully reduced without disrupting communication pathways essential to positive patient outcomes.

Currently, this complex but crucial relationship between interruptions and outcomes is poorly understood.<sup>11-13</sup>

In this issue of the *Journal of Graduate Medical Education*, Ly and colleagues<sup>14</sup> add to the growing body of health care research investigating interruptions to health professionals’ workflow. They report the results of a direct observational study to measure interruptions to junior medical staff due to pagers. Twenty-four junior medical officers (equivalent to junior residents in the United States) were each observed during 2 days and received 163 page calls, or about 6 to 8 observed calls per resident. Of these pager calls made to the residents, 16% (n = 26) were judged to be inappropriate, 58% (n = 95) were appropriate but not urgent, and 27% (n = 44) were appropriate and urgent. A New Zealand study of 844 pager calls found a very similar distribution among these categories.<sup>15</sup> These results confirm that many interruptions to clinical work are necessary and are, in themselves, integral to the delivery of safe and efficient care. At the same time, however, despite most pager calls being judged by residents to be appropriate, qualitative results suggest a high level of annoyance and frustration among junior doctors when interrupted by pagers.<sup>14</sup> Such stresses are typically associated with other consequences of interruption, like increased cognitive burden. This finding is telling because it highlights the complexities in seeking to understand when, how, and how often the potentially negative consequences of interruptions to clinical work outweigh the more evident benefits of instant communication to facilitate the delivery of appropriate, timely care.

Unfortunately, few studies to date have linked interruptions to specific clinical outcomes. Our study of nurses and medication administration errors is one example.<sup>16</sup> We found a significant correlation between more frequent interruptions and more numerous—and more serious—errors in administering medication. As yet, there is no published comparable study, to our knowledge, linking clinical outcomes to interruption rates for physicians.

Although there has been some research into measures to reduce interruptions, many questions remain unanswered about their effectiveness. Two decades after the introduction of the Sterile Cockpit, several anecdotal and descriptive accounts of hospitals applying similar isolation-type concepts appeared.<sup>17-23</sup> These included applying a “no interruption zone” for preparing and checking medications and the use of “no interruption vests.” However, a lack of

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controlled studies to measure their effectiveness means it is difficult to reliably judge the short- and long-term value of such approaches. A more recent German study, in which physicians were encouraged to meet and identify ways to reduce unnecessary interruptions to work,<sup>24</sup> applied a controlled pre-post design and measured the rate of interruptions following the introduction of various strategies. There was no marked difference in the interruption rates for intervention and control wards, with both declining in the post period; a possible reason presented was that the interventions in effect spilled over from the intervention into other wards.<sup>24</sup>

Ly and colleagues focus on one particular mechanism of interruption: pagers. Overall, pagers appear to be a relatively minor source of interruption to clinicians after their entire workloads are examined.<sup>25</sup> For instance, emergency physicians are consistently shown to experience interruptions at a rate of 6 to 7 per hour.<sup>6,26–29</sup> Less is known about the rates of interruptions to physicians on general wards, but estimates are they are 3 to 4 per hour.<sup>24,25</sup>

Thus, a key question is, How frequent a rate of interruptions is too frequent? At what point does the rate of pager calls become detrimental to the efficiency, safety, and quality of care? The Ly et al study stops short of posing that question. Although Ly et al suggest it would be potentially valuable to reduce interruptions via pagers—especially those deemed by the receiver as “inappropriate”—we need to simultaneously ask what alternative communication channels may be open for communication among a highly mobile workforce. Evidence from a study of interns and residents in the United States by Wagner et al<sup>30</sup> found that, for nearly all types of clinical information, there was a greater preference for that information to be sent via pager rather than by e-mail. Pagers are a “push” system. Although they are designed to interrupt, they do not impose on busy clinicians the additional burden of seeking out information via passive platforms like e-mail.

The exchange of information is a 2-way process, and the context in which communication takes place also matters. Although we tend to focus on the effect of interruptions on the receiver, we also need to factor in the senders. In the Ly et al study, nursing staff were primarily trying to communicate information to doctors. Pages generally require the receiver to acknowledge and respond to the message. This tells the sender that the message has been received, although poor responses to pager calls have been reported.<sup>31</sup> In most instances, this means a task has been handed down the workplace chain, which allows the sender to focus on the next task. If, instead, e-mails are used or information is documented in patient records, in the anticipation that those records will be accessed, this

need for rapid confirmation is not satisfied. Although Ly and colleagues found that some pager calls were judged inappropriate because they provided redundant information, from a sender’s perspective, such pages may have been important in confirming the movement of a task along the chain.

Measuring the effect of an interruption is challenging, largely because of the difficulty in isolating its effects. To gain a clearer picture, we need more sophisticated studies that produce better data linking interruptions to measures of efficiency, quality, and safety of work. Not only do we need to understand the nature of the information being conveyed and to investigate whether, in some instances, there are more efficient and safer methods of communicating, but also we need to consider the comparative effectiveness of such alternatives before we can begin to propose realistic solutions.

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