

Nature and Impact of Interruptions on Clinical Workflow of Medical Residents in the Inpatient Setting

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Abstract

Background Medical officers (trainees) in their first to third postgraduate years (PGY-1–3s) work in complex, busy environments, performing tasks that require concentration and application of learned skills. There are frequently competing demands, and being paged is among the most common.

Objective We quantified and described the effect of interruptions that paging created on the clinical workflow of PGY-1–3s during ward duties.

Methods This prospective study was conducted at 2 teaching hospitals in Sydney, Australia. Medical students were recruited as observers to log interruptions of PGY-1–3s' workflow arising from pages from other members of the hospital team.

Results Forty-two pairs consisting of a PGY-1–3 trainee and an observer were recruited, with 24 proceeding to data collection. Nursing was the most frequent source of pages (47%); other medical staff accounted for 16% of

pages, allied health for 12%, and others for 24% (with pharmacy the most common). Pages commonly involved direct patient care (46%), followed by medication issues (21%). Tasks interrupted by pages encompassed direct patient care (37%), indirect patient care (15%), and documentation (12%). Only 27% of pages were assessed as appropriate and urgent, while 58% were considered appropriate but not urgent, and 16% were not appropriate. Only 38% of pages were judged to be clinically more important than the task they interrupted.

Conclusions Pages frequently interrupted direct patient care activities for PGY-1–3 trainees, and a significant proportion of pages were identified as either not requiring immediate attention or not appropriate, resulting in potentially avoidable interruptions to clinical workflow. Alternate means of alerting trainees to nonurgent tasks may reduce interruptions and facilitate patient care.

Editor's Note: The online version of this article contains the standardized paper-based recording tool used in this study.

Introduction

Medical officers (postgraduate trainees) in their first to third postgraduate years (PGY-1–3s) are key members in

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hospital clinical teams. They are often first to be contacted regarding patient care and management and, consequently, receive many interruptions during the course of their duties, often via the paging system.¹ The person initiating the page is unaware of the PGY-1–3s' activities when he or she is paging. Interruptions might include requests to rewrite medication charts, liaise with nursing and allied health staff and coordinate discharge arrangements, meet with families, and assess and provide care for a patient whose condition is deteriorating.

PGY-1–3s are reactive in their responses to pages received.² A positive effect of the use of paging systems is that they improve situational awareness by highlighting tasks that require completion. However, this occurs at the cost of disruption to the PGY-1–3s' ongoing clinical workflow.³ Interruptions increase time on task¹ and increase anxiety and stress, recognized as an adverse issue in trainee performance.⁴ Other studies have shown that most pages received by trainees concern nonurgent tasks⁵

and often interrupt direct patient care.⁶ Use of paging systems continues, however, as a viable means of communication to alert staff to urgent tasks and demands.⁷ It has been suggested that prioritization or categorization of tasks may assist trainees in devising response strategies most appropriate to the task.⁵

Studying the impact of interruptions on trainees will assist in developing strategies to ensure that their workflow is disrupted less often and that competing concerns of patient care and management from other staff are met in the most appropriate manner. While some degree of workflow interruption may be expected in any workplace, enhancing the use of technology as a communication tool requires identification and minimization of unnecessary interruptions and the inefficiencies they create. Existing studies of the effects of paging on trainees to date have focused on emergency departments or after hours ward duties,^{1,4,5} with the interruptions paging poses for routine ward-based work not examined. In addition, research primarily has used self-reporting.^{4,6} This method risks introducing reporting bias, whose direction and effect cannot be determined. At the same time, use of external observers used to date,^{1,8} such as research assistants or nursing staff, may not identify the true nature of interruptions experienced by PGY-1–3s in clinical teams.

We sought to investigate the effects of paging on trainee workflow during routine ward work duties through the novel use of medical students completing an attachment with clinical teams as part of their preintern term. Although primarily a descriptive study, our null hypothesis was that addressing issues raised by paging were always more critical than the task at hand.

Methods

A descriptive cross-sectional study was performed with a convenience-based sample drawn from PGY-1–3s at 2 metropolitan teaching hospitals (a tertiary referral center and a metropolitan district hospital). Australian postgraduate medical education and training occur almost entirely within the public hospital sector.⁹

Ethical approval for the study was obtained through the Concord Repatriation General Hospital Human Research Ethics Committee. Other members of the hospital team were not informed of the nature and intent of the study.

Preintern (PRINT) medical students and PGY-1–3 volunteers were recruited and paired, with the PRINT student observing and documenting the PGY-1–3s' activities and interruptions during business hours on medical and surgical wards on 2 typical days of activity during November 2010. Surgical involvement included vascular, orthopedics, colorectal, upper gastrointestinal, breast, and

What is known

Paging interruptions for residents can negatively affect resident learning and direct patient care.

What is new

An Australian study finds that most pages sent to residents in the inpatient setting did not require immediate attention, resulting in potentially avoidable interruptions to clinical workflow.

Limitations

Small sample size and possible reporting bias limit generalizability.

Bottom line

Alternate means of alerting trainees to nonurgent tasks may reduce interruptions and facilitate patient care and resident learning.

endocrine teams. Medical involvement included cardiology, nephrology, palliative care, oncology, respiratory medicine, gastroenterology, hematology, immunology, and rheumatology teams. Within study sites, PRINT students were final year medical students attached to a medical or surgical team shortly before completing their degree. PRINT students were trained at a calibration session to use a standardized, paper-based survey form developed from existing instruments (see online supplemental material).⁸ This form recorded the source and duration of interruption, the task interrupted, and a classification of the importance and urgency of the page. The paging technology used provided a call-back number, although transmission of one-way text was technically possible. Pages were assessed as appropriate if the PGY-1–3s perceived them as requiring attention, whereas urgency was defined as whether the issue required attention within 1 hour. This classification scheme is in alignment with previous approaches to categorizations of appropriateness, achieved through focus groups with PGY-1–3s, medical consultants, and nursing staff.^{4,5,10}

Data were collated, and descriptive statistics were calculated and analyzed. For each page, we considered whether the task interrupted was more clinically critical than the task requested in the page. We categorized the nature of the tasks being interrupted or tasks being paged for as (1) direct patient care; (2) indirect patient care, medication-related tasks and communication; and (3) administration, supervision/education activities, and social activities. The detail of the time at which each page was received was not explicitly recorded.

Results

Forty-two pairs consisting of a PGY-1–3 trainee plus a PRINT student were enrolled and given recording materials

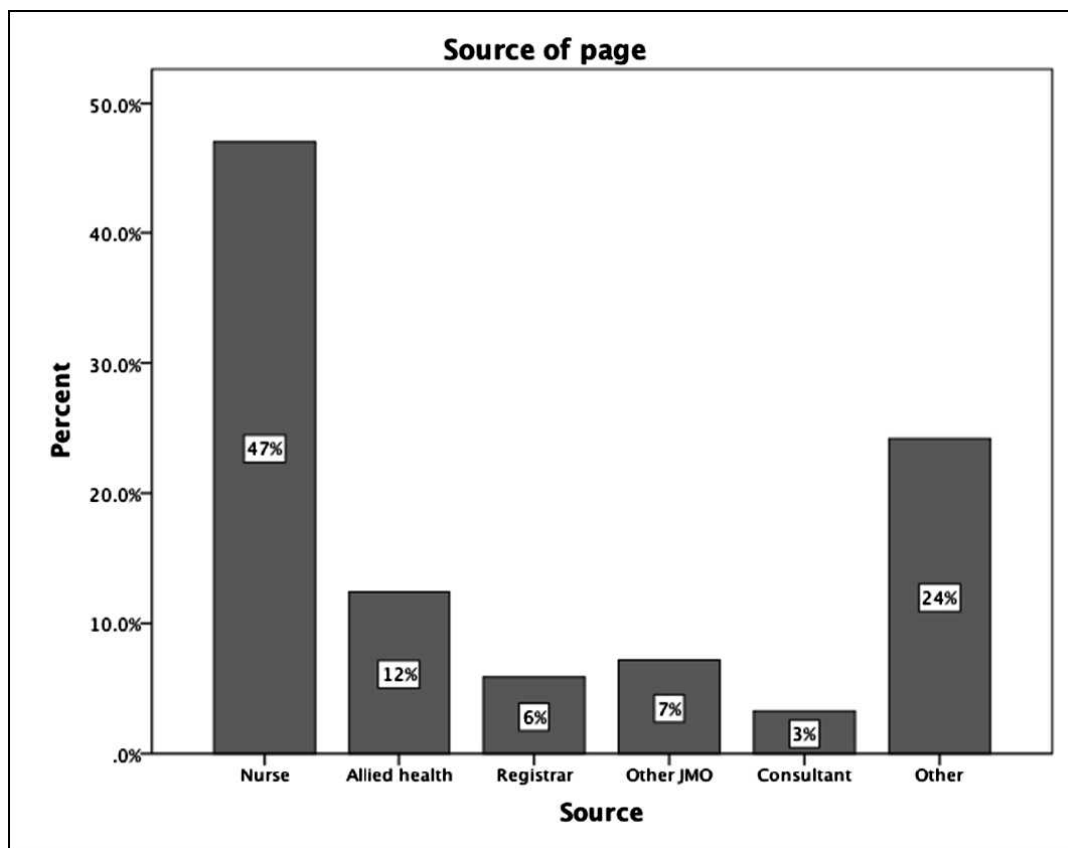


FIGURE 1 | SOURCE OF PAGED TASK

for the study, of which 24 proceeded to complete data collection. Potential contributors to drop out in participation were ascertained through informal participant reports, including responses such as voluntary observers received no financial remuneration and the fact that PGY-1–3 rosters and student teaching schedules at times necessitated pairs to be separated during the designated period of observation. A total of 163 pages were recorded (with a mean 6.8 pages per observed PGY-1–3). Nurses were the most frequent source of pages (47%), followed by other (24%, with pages in this category predominantly from the pharmacy department), allied health (12%), other PGY-1–3s (7%), registrars (6% [a registrar is a physician undertaking accredited training in a specialty discipline, usually a PGY-3 or later]), and consultants (3%). Details are shown in FIGURE 1.

Nearly half of the pages received concerned direct patient care (46%), and one-fifth (21%) concerned medications, with indirect patient care, communication, documentation, administrative tasks, education, and social activities comprising the remainder. Direct patient care tasks were the most frequent subject of pages; however,

they also were the tasks most often interrupted by paging (37%), with indirect patient care (15%) and documentation (12%) among other frequently interrupted activities. While 38% of pages were ranked as more important than the task interrupted, the majority of pages (62%) concerned tasks that were of equal or lesser importance than the task interrupted.

For all page events in the study, we collected data for the appropriateness and urgency of pages (assessment of the need for the interrupting event) by using a subjective classification.⁵ The majority of pages received were appropriate and nonurgent (58%), while appropriate and urgent pages comprised 27%, and nonappropriate pages constituted 16%. These consisted primarily of pages for tasks that already had been completed or repeated pages for nonurgent tasks (FIGURE 2). When appropriate but nonurgent pages were considered by source, 61% of pages from nursing staff fell within this category, compared with 68% of those from allied health, 44% of those from registrars, and 73% of those from other PGY-1–3s. There was no significant association between the appropriateness of a page and its source.

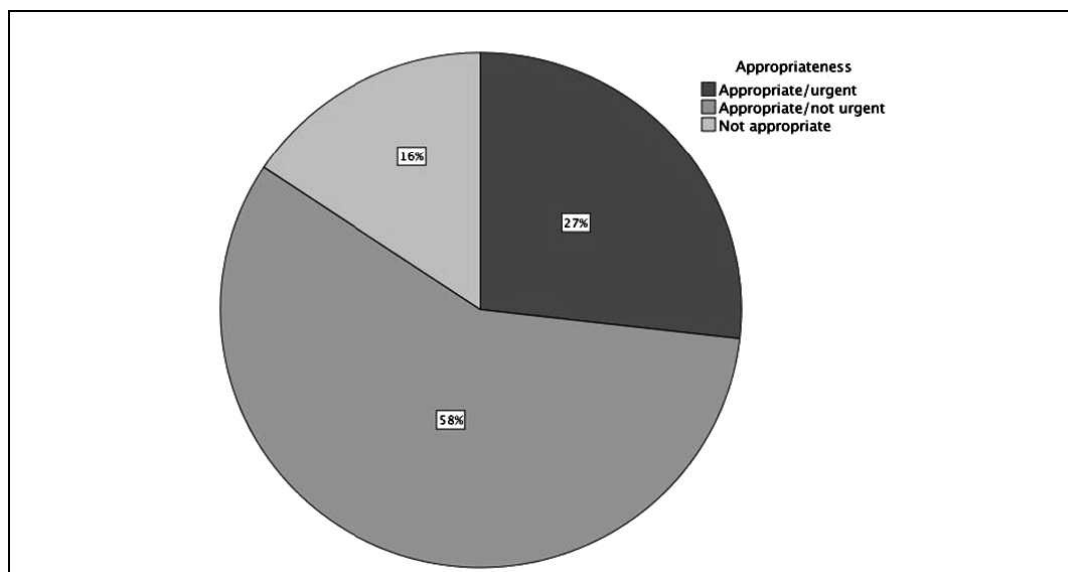


FIGURE 2 | APPROPRIATENESS CLASSIFICATION OF PAGE RECEIVED

Most pages (73%) could be addressed in less than 5 minutes, whereas 16% took between 5 and 30 minutes and 5% more than 30 minutes (FIGURE 3). All interruptions requiring more than 30 minutes were those involving direct patient care. Strategies used by PGY-1–3s to deal with interruptions were relatively equally divided between finishing the paged task and then returning to their current task (48%) and finishing the current task and then completing the paged task (42%). Delegation was used to address pages on 3% of occasions, and in 7% of cases, the page was ignored.

A qualitative component of the study was performed, wherein a free text field was included in the instrument and comments were noted. Themes that emerged from free text comments revolved around frustration, annoyance, and irritation and conveyed mostly negative responses such as frustration.

Discussion

In this observational study of pager-based interruptions of the clinical workflow of ward-based PGY-1–3s, using the novel approach of senior medical students as observers, it was noted that most pages were from nurses, were appropriate but not urgent, and required less than 5 minutes to complete. Only 38% of pages were judged to be more clinically important than the task which was interrupted. Appropriate but nonurgent and inappropriate pages, which constituted 73% of pages received, represented potentially avoidable interruptions to PGY-1–3s' workflow. These interruptions are significant because of adverse events noted in the literature regarding the adverse effects of

interruptions on efficiency and error.^{11–14} Task reacquisition times within this context have had limited prior exploration in one study,¹ which utilized dedicated observers. Our study examined behaviors among existing members of the clinical team and was not resourced to capture these data. We acknowledge that task reacquisition times and accuracy, and time stratification of pages received are important areas for future exploration.

Comments recorded by the PRINT students concerning PGY-1–3s' reactions to pages included trainees' irritation and frustration. Comments were mostly negative and offer an interesting insight into the affective responses underlying PGY-1–3s' reactions to pages. Of the 35 comments recorded, 24 conveyed strongly negative themes, including being "annoyed," "stressed," "already received [the page]," and "frustrated" or "already completed task." Although not explicitly explored, these comments suggest a potential contribution of pager-based communication toward maladaptive and hostile interpersonal communication within the hospital setting. Hospital environments which depend on such maladaptive methods of communication have been identified in recent reports as a factor leading to adverse patient outcomes.¹⁵

This study has several limitations. Although use of senior medical students as observers offers a means of capturing observational data from an existing member of the clinical team, only 57% of enrolled student observers proceeded to data collection, and there is potential for incomplete reporting. Incomplete reporting is likely, given the relatively low numbers of paging events recorded. It is postulated, however, that more urgent events were more

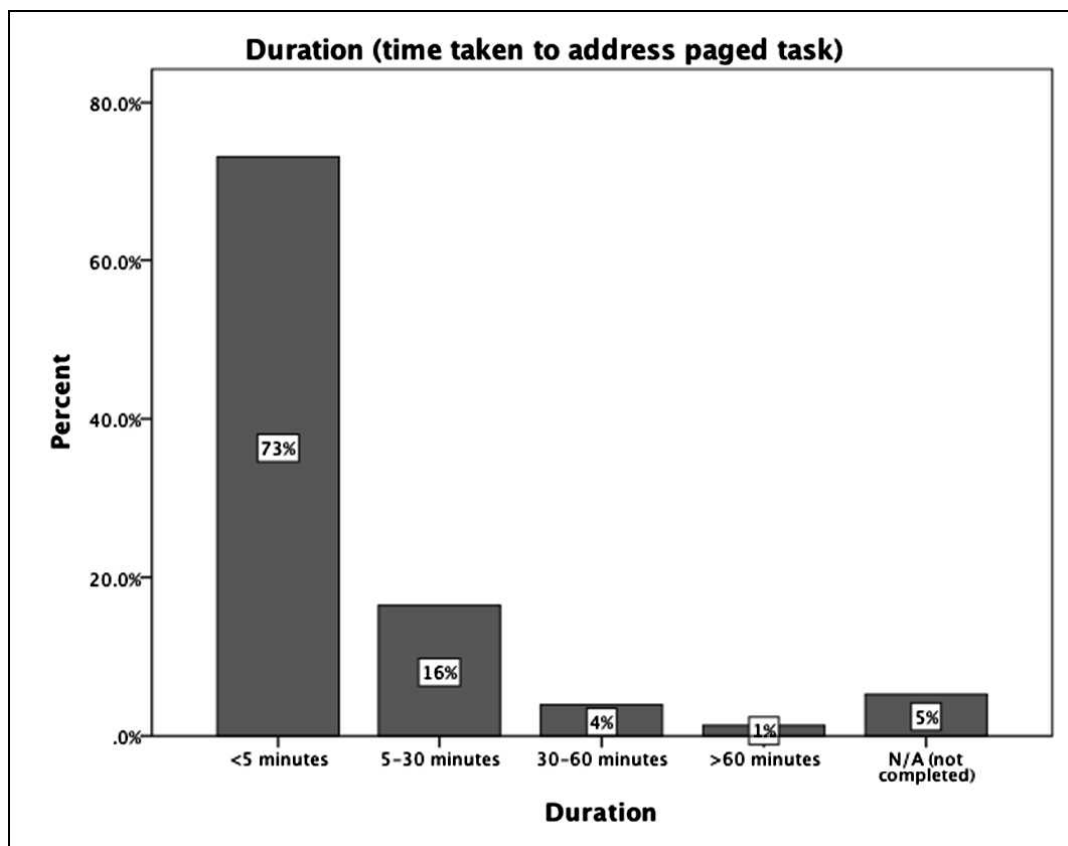


FIGURE 3 | DURATION OF PAGED TASKS

likely to be recorded, with potential omission of more trivial paging events serving to strengthen our conclusions. By the time the PRINT students were involved in their study, they had already been awarded their jobs in a public hospital system for the following year, so it is unlikely that they had any bias against reporting negative events. Outcomes were reported only in aggregate form, rendering the source of data anonymous, further mitigating against biased reporting. Another limitation is the potential for alteration in behavior of PGY-1–3s, given their awareness of being observed; however, this is difficult to measure and to control for, given their involvement in classification and qualitative assessment of pages received, using our methodology.

Conclusions

This study demonstrates that pages received by PGY-1–3s frequently interrupt direct patient care. Of received pages, a significant proportion was identified as either not requiring immediate attention or not appropriate. These events may be considered potentially avoidable interruptions to PGY-1–3s' workflow. Although primarily descriptive, our data are not consistent with the null hypothesis that addressing

issues raised by paging were always more critical than the task at hand. Alternate means of alerting PGY-1–3s to nonurgent tasks may reduce interruptions and facilitate patient care.

To address negative aspects of nonappropriate interruptions, alternative means of communicating nonurgent tasks appear sensible. In the present ever-evolving world of electronic mobile communication, measures such as prioritized or coded messages, computerized task lists, mobile texting or a predictable pattern of attendance at different wards could be used. The impact of pages on interrupted work is demonstrated in the negative comments collected from participants. While we feel our findings are applicable within the public metropolitan teaching hospital setting, we do recognize they are not necessarily transferable to other contexts where interprofessional relationships may differ.

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