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Night-time communication at Stanford University Hospital: perceptions, reality and solutions

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ABSTRACT

Background Resident work hour restrictions have led to the creation of the 'night float' to care for the patients of multiple primary teams after hours. These residents are often inundated with acute issues in the numerous patients they cover and are less able to address non-urgent issues that arise at night. Further, non-urgent pages may contribute to physician alarm fatigue and negatively impact patient outcomes.

Objective To delineate the burden of non-urgent paging at night and propose solutions.

Methods We performed a resident review and categorisation of 1820 pages to night floats between September 2014 and December 2014. Both attending and nursing review of 10% of pages was done and compared.

Results Of reviewed pages, 62.1% were urgent and 27.7% were non-urgent. Attending review of random page samples correlated well with resident review. Common reasons for non-urgent pages were non-urgent patient status updates, low-priority order requests and non-critical lab values.

Conclusions A significant number of non-urgent pages are sent at night. These pages likely distract from acute issues that arise at night and place an unnecessary burden on night floats. Both behavioural and systemic adjustments are needed to address this issue. Possible interventions include integrating low-priority messaging into the electronic health record system and use of charge nurses to help determine urgency of issues and batch non-urgent pages.

INTRODUCTION

Resident work hour restrictions, implemented in 2003 in the USA, have radically changed how patient care is delivered. Traditionally, a single team of physicians was responsible for patient care. Currently, limits on the number of consecutive hours residents can work have made this impossible. To address the need for coverage of patients after hours, the 'night float' was created.[1] During daytime hours, teams operate in the same way they did traditionally and clarification of any issue is easily done. After hours, night floats are responsible for covering the patients of several primary teams and are frequently inundated with acute problems, making them less able to respond to non-urgent pages and issues. This model is widely prevalent in the USA.[2] Similarly in Europe, where hour restrictions are even more rigorous, the use of night floats for ~12-hour shifts is common.[3]

Several studies have reviewed non-urgent paging and proposed categorisation schemes. Variations of urgent, non-urgent and unknown are the most prolific. The conclusion that non-urgent paging remains an issue, particularly at night, is ubiquitous.[1 4–7] At our institution, an internal survey of internal medicine and general surgery residents estimated around half of pages sent after hours were non-urgent. About two-thirds of same residents felt that their workflow was interrupted 'often' or 'all of the time' responding to these issues. In comparison, night shift nurses felt that only about one-fourth of pages sent after hours were non-urgent (Sun *et al*, 2014, unpublished data).

Previously used to describe nursing desensitisation to bedside alerts,[8] non-urgent paging may contribute to physician alarm fatigue. This has not been studied to our knowledge, but the concept of repeated false alarms (or non-urgent pages), leading to desensitisation and missed alarms is possible. Given that improvement of alarm fatigue is a Joint Commission National Patient Safety Goal and has been implicated in patient deaths, study into the scope of non-urgent paging at night is warranted.

In this study, we aim to delineate the burden of non-urgent paging at night and propose methods to improve communication. To accomplish this, we performed a detailed and interdepartmental analysis of pages sent at night, with a comparison

of attending physician and nursing reviews of resident-categorised pages in a large tertiary care centre. A separate nursing survey was performed to gain their perspective. We hypothesised that night-time non-urgent pages, a potential source of inefficiency and dissatisfaction, remain a significant issue at our institution and solutions are needed.

METHODS

At our institution, patient teams are signed out by the primary team to a night float between 17:00 and 19:00, until 06:00 to 07:00 the next day. Internal medicine night floats cover all general medicine, haematology/oncology, and cardiology primary teams. General surgery night floats cover all general surgery services, which include a total of nine primary teams. In addition to cross-coverage, the internal medicine night float team is responsible for consults and admissions. The general surgery night float team is responsible for accepting transfers and a portion of new consults. Paging is the only official method of communication with night floats, as they do not have assigned hospital phones or routinely use personal cellphones. Pages are primarily sent through a computer system that allows for alphanumeric paging, though telephone-based numeric paging is possible. Our system does not allow us to differentiate between telephone-based and alphanumeric paging when only a number is received.

Patients are admitted to standard acute care ward and intermediate intensive care units (ICU), with nursing ratios of 4:1 and 3:1, respectively (no ICU patients). Nursing units are specialised within the hospital to general medicine, medicine specialties and surgical specialties. Colocalisation of patients by service on an appropriate ward is attempted with 70%–90% success, depending on hospital capacity. Physician workrooms are found throughout the hospital, but are not reliably on the same ward as covered patients.

We reviewed 1820 pages to night floats between September 2014 and December 2014. These months allowed sufficient time for first year residents to gain experience in handling floor pages. Night floats at our institution rotate in 4-week blocks. We reviewed two to three random nights of pages for each resident during the third or fourth week of their rotation. This allowed us to control for variation between residents. Use of weeks in the second half of rotations was done to avoid any aberrations in paging frequency that may have resulted from inexperience. Six hundred of the pages were to general surgery and 1220 were to internal medicine. We collected data on date/time, page content, sender, if FYI (for your information) was specifically mentioned, specific request for an order, specific request for patient evaluation and page urgency. For internal medicine pages, a third were received by second and third year residents and two-thirds were received by interns. For general surgery pages, all were received by interns.

Assessment of internal medicine pages was done by one second year resident. Assessment of general surgery pages was done by two second year residents and one fourth year resident. Pages were categorised as urgent, non-urgent, sender error or unknown. Urgent pages

Table 1 Page assessment

	Combined	Internal medicine	General surgery
Page assessment			
Urgent	62.1% (1131)	63.2% (771)	60.0% (360)
Non-urgent	27.7% (505)	26.2% (320)	30.8% (185)
Sender error	4.7% (86)	3.9% (48)	6.3% (38)
Unknown	5.4% (98)	6.6% (81)	2.8% (17)
Urgent page categorisation			
Vital sign issue	15.3% (173)	16.3% (126)	13.1% (47)
Urine output related	3.2% (36)	2.7% (21)	4.2% (15)
Mental status related	1.7% (19)	1.8% (14)	1.4% (5)
Urgent order	53.4% (604)	50.6% (390)	59.4% (214)
Urgent request for evaluation	4.2% (48)	4.2% (32)	4.4% (16)
Critical lab value	12.8% (145)	15.7% (121)	6.7% (24)
MD to MD communication	5.2% (59)	5.3% (41)	5.0% (18)
Other	4.1% (46)	3.2% (25	5.8% (21)
Non-urgent page categorisation			
Non-urgent vitals	8.1% (41)	10.0% (32)	4.9% (9)
Non-urgent patient update	31.1% (157)	28.4% (91)	35.7% (66
Low-priority order	22.8% (115)	21.2% (68)	25.4% (47)
Patient/family updates	4.2% (21)	3.8% (12)	4.9% (9)
Fixing orders	9.7% (49)	10.3% (33)	8.6% (16)
Diet	5.9% (30)	5.9% (19)	5.9% (11)
Discharge related	2.4% (12)	3.1% (10)	1.1% (2)
Non-critical lab issue	13.7% (69)	15.9% (51)	9.7% (18)
Other	2.0% (10)	1.2% (4)	3.8% (7)
Sender			
MD/ED	3.7% (67)	3.7% (45)	3.7% (22)
RN	84.6% (1539)	84.1% (1026)	85.5% (513)
Pharmacy	4.2% (76)	3.7% (45)	5.2% (31)
Other	0.7% (12)	0.4% (5)	1.2% (7)
Unknown	6.9% (126)	8.2% (100)	4.5% (27)
'FYI' in text			
Yes	12.4% (225)	11.9% (145)	13.3% (80)
Order requested			
Yes	39.3% (715)	39.1% (477)	39.7% (238)
Evaluation requested			
Yes	3.0% (55)	2.2% (27)	4.7% (28)

ED, emergency department; FYI, for your information; MD, Doctor of Medicine; RN, registered nurse.

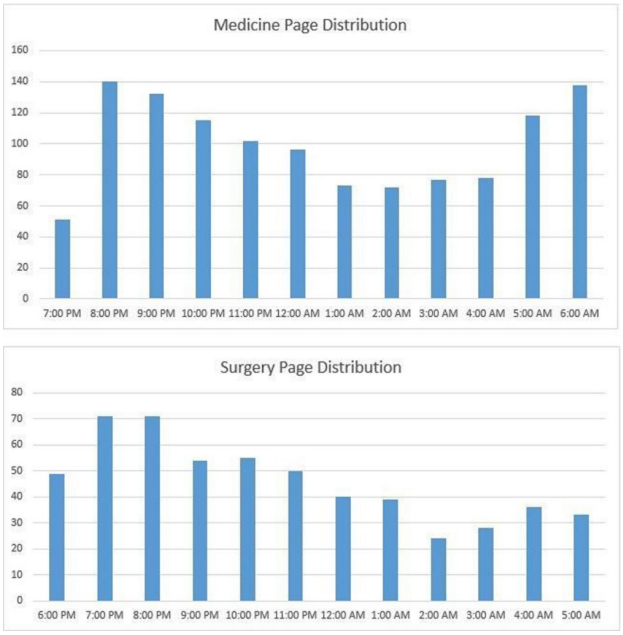

Figure 1 Page distribution by hour.

required a response from the night float resident (vital sign abnormalities, low urine output, mental status/neurologic changes, urgent medications/procedures/orders, appropriate requests for evaluation, critical results and doctor-to-doctor communications). Urgent orders included treatment of pain, insomnia, specific patient requests or other acute conditions. Non-urgent pages did not require a response overnight (normal vital signs, non-urgent patient status updates, low priority medications/orders, family/patient update requests, fixing orders, discharge-related issues, non-urgent results). Low-priority medications/orders included diet orders, bowel regimens, 'just in case' requests, or issues that could be addressed by the primary team in the morning without detriment to patient care. Patient/family updates are more effectively done by primary teams, as the night float will only have received a brief report and will not be as knowledgeable about the overall plan of care. Sender error pages were sent to the wrong individual or contained insufficient information (pages that contained no message or just a number). Unknown pages were those that could not be categorised without additional information. After this initial assessment was done, we further analysed the pages as sent by hour, to describe the distribution of pages at night. We excluded the hours of 17:00 and 06:00 for the surgery pages, as this is when pagers are being signed out and the number of pages received did not accurately represent the number of pages sent during these hours. The 19:00 hour of the medicine data set was felt to potentially have this issue, but to a lesser effect, and was left included.

Attending review of a random 10% of pages was done to provide validation. All 60 general surgery pages were sent to a single general surgery attending and two sets of 61 medicine pages were sent to one of two medicine attendings. Results of attending reviews were compared with resident page categorisations and used to calculate inter-rater reliability (IRR). This process was repeated for the medicine pages using a medicine ward assistant nurse manager with more than

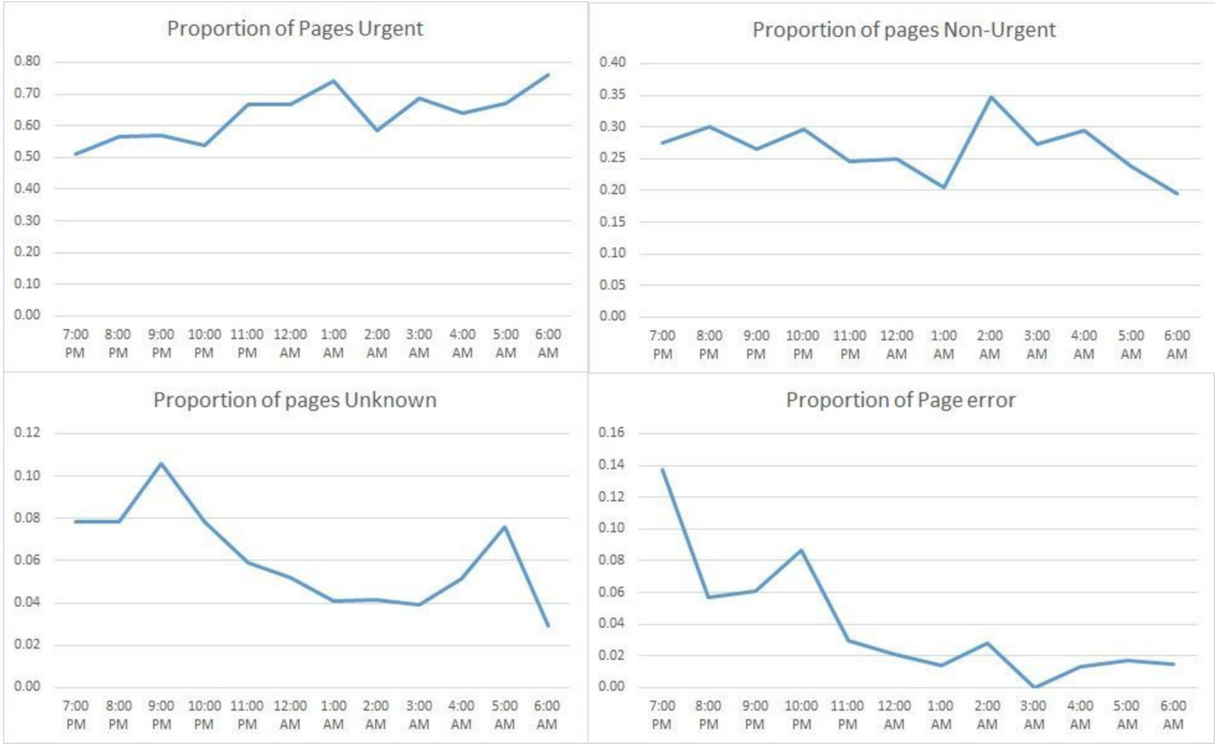

Figure 2 Medicine page assessment by hour.

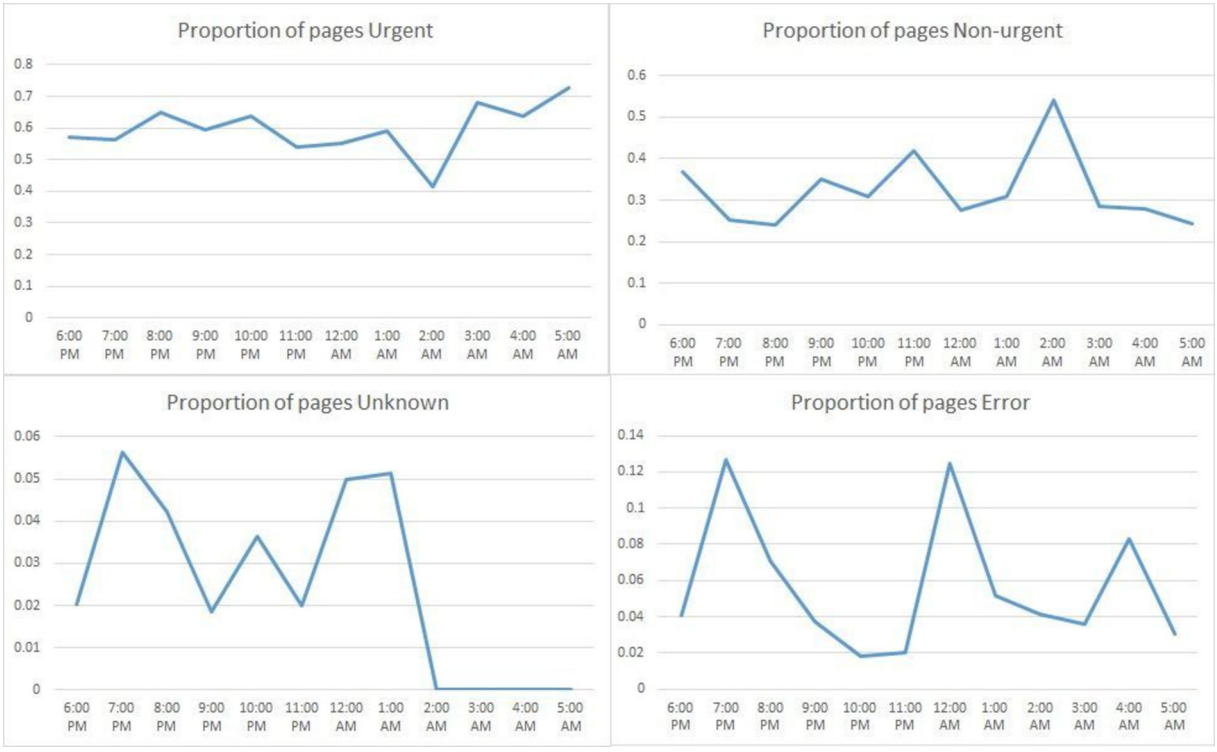

Figure 3 Surgery page assessment by hour.

5 years of intermediate ICU experience, and compared with both attending and resident categorisations.

Finally, a new survey of night shift nurses was conducted (see online supplementary appendix 1). The survey was sent via email to 56 night shift nurses on an internal medicine ward and focused on how respondents viewed their own paging practices. We received an institutional review board exemption from our institution for all aspects of this study.

RESULTS

A total of 1820 pages to night float residents between September 2014 and December 2014 were reviewed (table 1). Key findings from this revealed that 27.7% of pages sent at night were non-urgent and 62.1% of pages were urgent. Comparing our two groups, 26.2% of internal medicine pages versus 30.8% of general surgery pages were non-urgent (p=0.04), and 63.2% of internal medicine pages versus 60.0% of general surgery pages were urgent (p=0.19).

An analysis of the distribution of pages sent by hour and how this correlated with page urgency was performed for internal medicine and surgery pages separately (figures 1–3). Overall, there appeared to be a peak of pages between 19:00 and 21:00 with a nadir of pages around 02:00. There was no overall trend between time of night and page urgency, though the 02:00 hour did appear to have an increase in the frequency of non-urgent pages and a corresponding drop in the frequency of urgent pages in both data sets.

To validate resident categorisation of page urgency, attending review of 10% of pages with subsequent IRR calculation was performed. This was done for one set of 60 general surgery pages and two sets of 61 internal medicine pages. An additional categorisation of the internal medicine samples was done by an assistant nurse manager from a medicine ward. The main difference between resident/attending and nurse categorisation was a higher proportion of pages categorised as non-urgent and a lower proportion of pages categorised as urgent by the nurse (tables 2 and 3).

Table 2 Attending, resident and nurse categorisation of samples

	Attending		Resident		Nurse	
Page assessment	Set 1 (%)	Set 2 (%)	Set 1 (%)	Set 2 (%)	Set 1 (%)	Set 2 (%)
Urgent	62.7	76.3	59.3	72.9	49.2	52.5
Non-urgent	22.0	20.3	23.7	23.7	35.6	42.4
Sender error	13.6	0	13.6	0	13.6	0
Unknown	1.7	3.4	3.4	3.4	1.7	5.1

Table 3 Inter-rater reliability for attending, resident and nurse categorisations

	Surgery pages	Medicine pages 1	Medicine pages 2
Resident-attending	0.92	0.95	0.93
Resident-nurse	X	0.82	0.72
Attending-nurse	X	0.82	0.76

Table 4 Nursing survey results

Question	Responses	
What types of pages do you consider to be non-urgent?	In and out update	16.7% (5)
	Family concerns	26.7% (8)
	Orders for the next day	73.3% (22)
	Downgrading level of care	26.7% (8)
	Expected treatment response	63.3% (19)
	Non-urgent patient request	90.0% (27)
	Other	6.7% (2)
Do you send non-urgent pages at night?	Yes	26.7% (8)
	Sometimes	46.7% (14)
	No	26.7% (8)
Do you send FYI pages at night?	Yes	56.7% (17)
	Sometimes	36.7% (11)
	No	6.7% (2)
Do you consult with the charge RN or float RN before sending non-urgent pages?	Yes	16.7% (5)
	Sometimes	43.3% (13)
	No	40.0% (12)
Do you combine non-urgent updates or requests into one page?	Always	10.0% (3)
	Frequently	66.7% (20)
	Sometimes	20.0% (6)
	Rarely	0.0% (0)
	Never	3.3% (1)
Do you use the MD handoff report to understand the plan of care for the patient?	Yes	83.3% (25)
	Sometimes	16.7% (5)
	No	0.0% (0)
Do you find the information in the MD handoff helpful?	Very helpful	43.3% (13)
	Somewhat helpful	43.3% (13)
	Neutral	13.3% (4)
	Somewhat unhelpful	0.0% (0)
	Very unhelpful	0.0% (0)
Does the information in the MD handoff change your frequency of paging the MD at night?	Yes, it increases.	3.3% (1)
	Yes, it decreases.	60.0% (18)
	No, change	36.7% (11)
If your frequency increases, are the pages more often urgent or non-urgent?	More urgent	100.0% (1)
	More non-urgent	0.0% (0)
	Some urgent and some non-urgent	0.0% (0)

FYI, for your information; MD, Doctor of Medicine; RN, registered nurse.

A total of 30 night shift nurses responded to our survey, for a response rate of 53.6%. Key findings were 73.3% of respondents send non-urgent pages at least sometimes, 93.3% of respondents send FYI pages at least sometimes and 83.3% of respondents do not consistently consult with a senior registered nurse prior to sending these pages (table 4).

DISCUSSION

In this study, we are one of the first groups to assess the frequency and reasons for non-urgent paging using multiple groups of healthcare providers (nursing, residents, attendings) representing two of the largest departments in the hospital (internal medicine and general surgery). Using these different perspectives, our results confirm the hypothesis that non-urgent paging remains a prevalent issue in the era of the night float.

Resident review of pages confirmed 27.7% of pages at night are non-urgent, which correlated well with attending review of samples. The most common reasons for non-urgent pages were non-urgent patient status updates, low-priority orders and non-critical labs. This represents a significant number of interruptions to the already busy duties of night floats. Indeed, a prior survey of residents at our institution found most felt their workflow was interrupted frequently by non-urgent pages. As shown by previous research, interruptions alone can contribute to medical errors and inefficiency, particularly when urgent tasks occupy the majority of an individual's attention.[9 10] With night floats responsible for formulating care plans, entering orders, admitting patients and assessing acute changes in patient condition, there may be significant risk associated with non-urgent paging. Similarly, non-urgent pages represent a type of false alarm for night floats. Alarm fatigue occurs when a provider is exposed to excessive number of false alarms, leading to potentially missed alarms and worse patient outcomes. As mentioned before, this is a significant patient safety issue and improvement is a Joint Commission National Patient Safety Goal.

Between internal medicine and general surgery, the difference in the proportion of non-urgent pages was statistically significant (26.2% vs 30.8%, p=0.04). However, the difference in proportion of urgent pages was not (63.2% vs 60.0%, p=0.19). The reasons for this discrepancy are unclear, though the absolute differences in percentage are small and may not be clinically significant. One possible explanation is that the internal medicine teams frequently use the 'hand off' feature in our electronic medical record (EMR), which may be viewed by nurses. General surgery handoffs are done verbally, physician to physician. This may suggest that tools within the electronic record are an important way to keep all parties updated on plans of care.

The nursing review of medicine page samples classified an even higher proportion of pages as non-urgent, compared with both resident and attending physician reviews. In general, our physician reviewers were conservative with their definition of urgent, so it is not surprising that an experienced nurse felt substantially more pages did not need to be sent overnight. This suggests that there is a learning curve to determining urgency. It is unreasonable to expect newly graduated nurses (often those assigned to night shift at our institution) to know what is urgent or not for the variety of patients they might see. There are several interventions we propose for this issue. The first is improve

colocation of patients to appropriately specialised units in the hospital and reduce the floating of nurses away from their home units. This enables nurses to gain experience and comfort with a specific population of patients, and in turn determine what issues are truly urgent. The second is to encourage floor nurses to run after-hours pages by the charge nurse (except in cases of emergencies), who will have more experience and be able to assist in triaging. When issues are determined to be non-urgent, the charge nurse can assist in diversion of these issues to the day team or batch pages. Third, night floats should call at least once to check in with the charge nurse of units housing many of their patients to address any concerns. At our institution, we have been unable to set a time to reliably do this (or night rounds), due to the number of acute issues that night floats must respond to. However, we have encouraged interns and residents to do this when possible.

Analysis of pages by hour showed that there is a peak in number of pages sent between 19:00 and 21:00 and a nadir around 02:00. Within the medicine data, a second peak in pages is seen at 05:00 and 06:00. The reasons for the distribution of pages are likely multifactorial, but the nursing handoff at 19:00 and the fact that morning labs may start coming back as early as 05:30 may contribute. Further, patients are more likely to be awake at these hours (and thus make requests), when compared with the period between 24:00 and 04:00. Assessment of page urgency by hour did not show any significant overall trend, but a spike in non-urgent page frequency at 02:00 was seen in both the medicine and surgery data. We suspect that around this time many patients are asleep and acute issues from earlier in the night have been addressed. From a nursing perspective, the night shift may feel this is an opportune time to address non-urgent issues.

Analysed as a subset, FYI pages are usually interpreted as no response is being requested. However, the majority of FYI pages we reviewed were about urgent issues. Additionally, several of these pages requested an order or evaluation of the patient. This suggests that there is a lack of consensus about what FYI means when included in a page. Discussion between physicians and nurses is needed to create a standard understanding and criteria for use of this in pages. Until this is done, we would caution residents that 'FYI' does not mean non-urgent. Similar to our prior recommendation, nurses should check with more experienced colleagues if they are unsure about the appropriateness of 'FYI' in a page.

Efforts to limit non-urgent communication at night are a shared responsibility of both physicians and nurses. For physicians, the primary team must engage the primary nurse during established rounding times and ensure they understand the daily plan of care for the patient. The primary team should touch base with primary nurses prior to signing out, to answer any questions. This may help reduce the spike in pages seen after the 19:00 nursing change in shift. Use of EMR tools, such as handoffs, may help keep all clinicians within the same shared mental model of patient care.

From the nursing survey, 73.3% of respondents recognised that they at least sometimes send non-urgent pages at night. This adds to the aforementioned internal survey where nurses estimated that approximately one-fourth of pages sent at night are non-urgent. The given reasons for 'non-urgent' pages were for both urgent (eg, vital sign abnormalities and requests for evaluation) and non-urgent (eg, documentation to protect oneself and cleaning up orders) issues, as defined by this study. Further, more than 90% of nurses reported sending 'FYI' pages at night for similar reasons. This again highlights the challenges of determining urgency and using FYI for nurses. Presenting an opportunity for improvement, the majority of nurses did not regularly consult with a charge nurse prior to sending these pages. Another useful finding was that over 80% of nurses regularly use the 'hand off' feature within the EMR. Nearly all reported it was helpful, and the majority felt it decreased their paging frequency. The results of this survey reinforce our suggestions that both behavioural adjustments and tools within the EMR may be useful in reducing non-urgent paging.

To address the need for alternative avenues of communication and improve utilisation of the EMR which all parties have access to, we have built a tool called 'Message Board' into our EMR as a way to communicate non-urgent messages. This opens on the initial page of a patient's chart and is easily seen and edited. Our goal is that this will be used for all non-urgent night-time communication. At this time, we are training nurses and residents to use this, and will evaluate for effectiveness once implemented.

Though this study has sought to address the limitations of previous studies by presenting a multidisciplinary viewpoint, it is not without limitations. The night float system at an academic hospital may not represent overnight coverage and communication patterns in community hospitals. Review of pages was done by a small number of residents, attendings and a single nurse manager. This could subject findings to individual biases, though resident and attending reviews did correlate well. Nursing units were a mix between standard wards and telemetry units, though nursing ratios were overall similar. All pages sent via telephone-based numeric paging were categorised as 'sender error', though it should be noted that pages sent by nurses (the largest group sending pages) are required by protocol to include a patient identifier, concise question and name within the page. As such, if these pages were sent by nursing, their categorisation as 'sender error' would remain correct.

CONCLUSION

Our study is a multidisciplinary review of night-time paging that defines the burden of non-urgent paging on night floats at a large tertiary care hospital. We found a significant proportion of pages sent at night are non-urgent, with common issues being non-urgent patient status updates, low-priority orders and non-critical labs. Non-urgent pages at night may distract from acute issues and lead to suboptimal patient care, as described in previous research. There are opportunities to improve night-time, non-urgent communication through use of electronic health record tools, floor nurses using charge nurses to help triage or batch pages and deferring non-urgent communications until the primary team has returned. Further studies are needed to determine which strategies are optimal.

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Competing interests None declared.

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Data sharing statement We have two internal institutional surveys referenced in our manuscript. These are located on the Stanford intranet and are available to the authors of the paper at any time. We have used these data only to supplement the findings of our paper, not as the primary conclusions. The nursing survey done for the purpose of this study has the complete results included in table 4.

REFERENCES

1 Young JB, Baker AC, Boehmer JK, *et al*. Using NNAPPS (Nighttime Nurse and Physician Paging System) to maximize resident call efficiency within 2011 accreditation council for graduate medical education (ACGME) work hour restrictions. *J Surg Educ* 2012;69:819–25.
2 Wallach SL, Alam K, Diaz N, *et al*. How do internal medicine residency programs evaluate their resident float experiences? *South Med J* 2006;99:919–23.
3 Morrison I, Flower D, Hurley J, *et al*. Working the night shift: a necessary time for training or a risk to health and safety? *J R Coll Physicians Edinb* 2013;43:230–5.
4 Kummerow Broman K, Kensinger C, Phillips C, *et al*. Characterizing the clamor: an in-depth analysis of inpatient paging communication. *Acad Med* 2016;91:1015-21.
5 Carlile N, Rhatigan JJ, Bates DW. Why do we still page each other? examining the frequency, types and senders of pages in academic medical services. *BMJ Qual Saf* 2017;26:24–9.
6 Fargen KM, O'Connor T, Raymond S, *et al*. An observational study of hospital paging practices and workflow interruption among on-call junior neurological surgery residents. *J Grad Med Educ* 2012;4:467–71.
7 Smith AD, de Vos MS, Smink DS, *et al*. Text paging of surgery residents: efficacy, work intensity, and quality improvement. *Surgery* 2016;159:930–7.
8 Sendelbach S, Funk M. Alarm fatigue: a patient safety concern. *AACN Adv Crit Care* 2013;24:378–86.
9 Coiera E. The science of interruption. *BMJ Qual Saf* 2012;21:357–60.
10 Li SY, Magrabi F, Coiera E. A systematic review of the psychological literature on interruption and its patient safety implications. *J Am Med Inform Assoc* 2012;19:6–12.

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