



## Frequency of calls to “on-call” house officer pagers at Auckland City Hospital, New Zealand

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### Abstract

**Aims** To quantify the number of calls made to specified on-call house officer pagers and to comment on possible implications for practice.

**Methods** Seven on-call pagers, covering a range of surgical and medical specialties at Auckland City Hospital, were identified. Data for a 4-month period from April to August 2004 was recorded and analysed in two groups: surgical services and medical services. Statistical software was used to calculate mean times between calls in specified time periods, and to compare differences between surgical and medical services.

**Results** 25,389 pages were recorded. These data are presented as mean frequency of calls to each pager, divided into four time periods.

The highest recorded rate was 6.9 minutes (mean) between calls in general surgery (1600—2200 shift), with the lowest recorded rate a mean of one call per 5 hours (2200–0800 shift) in geriatric and general medicine.

**Conclusions** Pager frequency is a potentially useful marker of job acuity and consequent junior doctor stress levels. This study demonstrated a high degree of variability in paging frequency both between services and between time periods. We recommend ongoing monitoring of paging frequencies and more even distribution of after-hours workload.

On-call junior doctors play a pivotal role in the provision of healthcare in the hospital setting. This role takes on increased importance during the after-hours period when it represents the medical frontline for the evaluation and management of ill patients. Hospitals worldwide have noted increasing patient demands, decreasing lengths of stay, and increasing staff shortages, with the result being that the workload for individual junior doctors has increased over time.<sup>1</sup>

In most cases, on-call junior doctors carry an alphanumeric pager which can be used by other staff to alert them to tasks requiring their attention.

There is increasing concern that the high frequency of calls may inhibit junior doctors from performing their duties efficiently and safely, and may also have a detrimental effect on morale, with subsequent flow-on effects on junior doctor recruitment. In an effort to combat this perceived “pager abuse”, some hospitals have developed paging policies in an effort to increase the efficiency of the process, while others have developed alternate communication systems such as text paging capability or on-call cell phones.

Auckland City Hospital is the largest tertiary teaching hospital in New Zealand, and employs approximately one-quarter of all junior doctor staff in the country. In this

study, we investigated the frequency of calls to the on-call pagers of four departments during different time periods in the week.

## Methods

Auckland City Hospital is a 570-bed adult inpatient hospital and is part of Auckland District Health Board, the largest public healthcare provider in New Zealand. Auckland District Health Board provides regional services for approximately 415,000 people along with some national specialty services. There are more than 7500 staff including approximately 500 junior doctors and nearly 3000 nurses.<sup>2</sup>

All on-call junior doctors at Auckland City Hospital are supplied with an electronic GSL Instant-Link 4 line alphanumeric pager operated by Telecom New Zealand Ltd. These pagers are capable of recording numbers as well as receiving text messages. In most cases, they have a memory capacity of 32 calls and a range of 50 kilometres from a transmitter. All calls to these pagers are distributed through a central computer transmission system that is capable of recording the time and origin of calls.

For this study, we identified seven on-call pagers that were responsible for covering a range of surgical and medical specialties during the after-hours period (1600–0800) at Auckland City Hospital. Paging data for a 4-month period from April to August 2004 was recorded and analysed. Pagers were split into two groups, with the pagers covering General Surgery, Vascular Surgery, Orthopaedics, Urology, Neurosurgery, Otorhinolaryngology (ORL), and Neurology\* grouped together as the surgical specialty pagers and those covering the services of Renal, Haematology, Oncology, Respiratory, Geriatrics, and General Medicine grouped together as the medical specialty pagers (see Table 1).

\*Neurology was included under surgical services as the after-hours house officer covers neurosurgery, ORL and neurology.

**Table 1. Beds available at Auckland City Hospital by specialty**

<b>Surgical specialties</b>	<b>Beds (N)</b>	<b>Medical specialties</b>	<b>Beds (N)</b>
Vascular	24	Geriatric medicine	94
Urology	26	Haematology	16
Otorhinolaryngology (ORL)	22	Oncology	23
Orthopaedics	50	General Medicine	93
General Surgery	45	Renal	24
Neurology *	22	Respiratory	24
Neurosurgery	22		
<b>Total</b>	<b>211</b>		<b>274</b>

\*Neurology is covered by the same House Officer as Neurosurgery and ORL.

The number of calls to each pager were analysed in the following periods:

- Weekdays 1600–2200 (evening on-call)
- Weekdays 2200–0800 (night on-call)
- Weekend 0800–2200 (day on-call)
- Weekend 2200–0800 (night on-call)

Once categorised, the mean time between each call in each time period was calculated, and comparison made between surgical and medical pagers. Calls per hour are reported as mean values with 95% confidence intervals. Differences across the surgical and medical groups were compared using an unpaired t-test and based on the mean number of calls per hour per month per pager.

Confidence intervals were calculated assuming a Poisson distribution and all statistical analysis was performed using STATA 7.0 statistical software (Stata Corporation, Texas Station, Texas, USA).

## Results

During the 4-month study period, a total of 25,389 pages were recorded and analysed. These data are presented as the mean frequency of calls to each pager in the different periods outlined above (see Table 2).

**Table 2. Minutes between calls; mean and (95% CI)**

Pager type	Weekday 1600–2200	Weekday 2200–0800	Weekend 0800–2200	Weekend 2200–0800
Surgical pagers	15.9 mins (15.8–16.0)	34.6 mins (34.4–34.8)	24.3 mins (24.1–24.5)	39.8 mins (39.5–40.1)
Medical pagers	23.4 mins (23.3–23.6)	50.6 mins (50.3–50.9)	28.3 mins (28.1–28.5)	51.6 mins (51.2–52.0)

The highest pager frequency rate of 6.9 minutes between calls was recorded on Friday 6 August 2004, during the 1600–2200 time period in general surgery. The lowest pager frequency of one call in 5 hours was identified on the pager covering the services of geriatric medicine and medical outliers on Tuesday 25 May 2004 during the 2200–0800 overnight shift (See Table 3).

**Table 3. Frequency of pages by specialty**

Service Area		Specialty	Time	Frequency
Surgical	High	General surgery	Friday 6th August, 4pm–10pm	6.9 min/page
	Low	Orthopaedics /Urology	Saturday 26th June, 10pm–8am	150 min/page
Medical	High	Haem/Onco/Gastro/Resp	Thursday 17th June, 4pm–10pm	7.3 min/page
	Low	Geriatrics/Medical outliers	Tuesday 25th May, 10pm–8am	300 min/page

Haem=Haematology; Onco=Oncology; Gastro=Gastroenterology; Resp=Respiratory

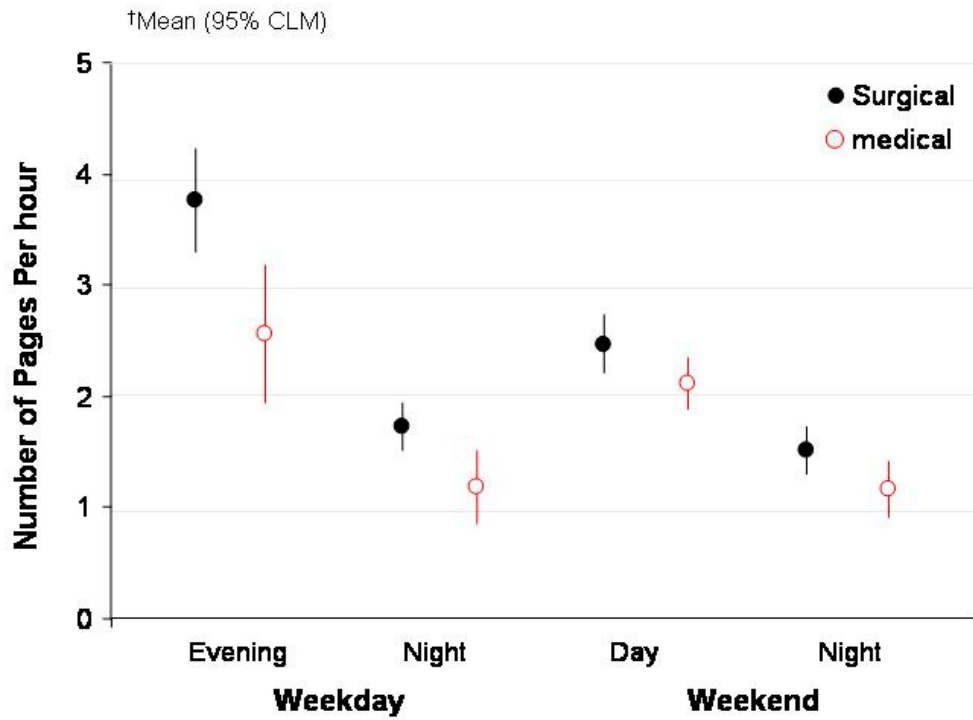
It is noteworthy that analysis of paging frequency data alongside hospital admission data for the same period showed no correlation between the number of admissions and the frequency of pager calls.

When looking at the number of calls per hour, surgical teams experience more calls during the weekday evenings ( $p=0.002$ ), weekday nights ( $p=0.005$ ), weekend days ( $p=0.04$ ), and weekend nights ( $p=0.03$ ) compared with medical services (See Figure 1). This is despite those house officers covering a lesser number of patients (see Table 1).

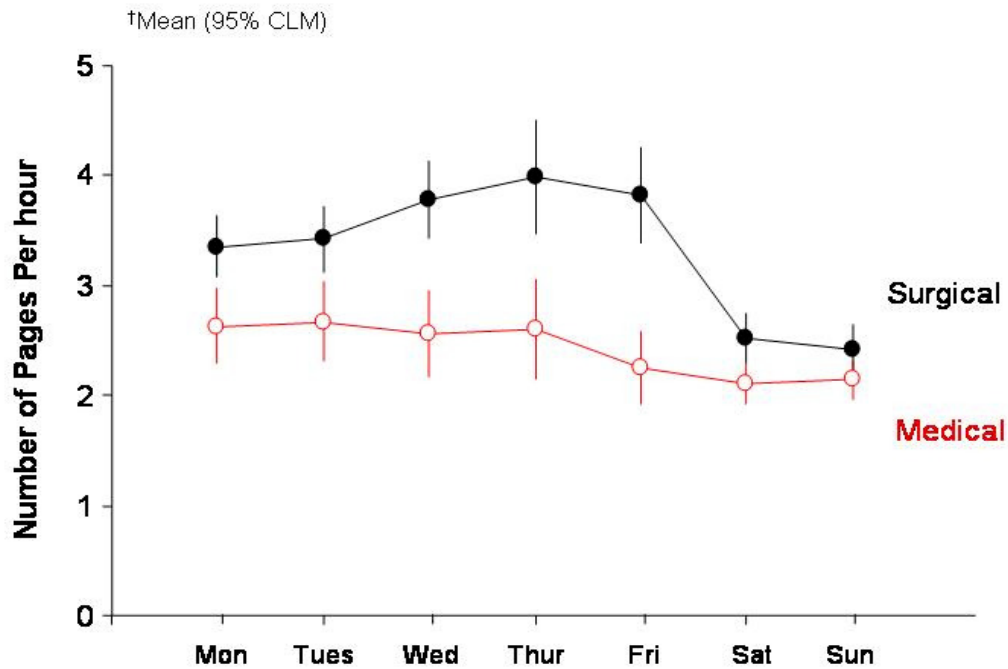
In line with the reduced staffing ratios during the night shifts, the frequency of calls was similarly reduced, with approximately one call every 35 to 52 minutes.

Comparison of weekday pager frequency (see Figure 2) revealed a consistent pattern of variation. Calls to surgical pagers increased in frequency as the week progressed whereas the medical pagers showed a reduction in frequency. Data from the Auckland Hospital database shows that the number of admissions usually decreases during the course of the week from a high on Monday to a low on Saturdays.

**Figure 1. Mean number of calls per hour by shift and specialty group**



**Figure 2. Mean number of calls per hour by day and specialty group**



## Discussion

In this study, we analysed the pager frequency of seven on-call house officer pagers in our hospital, during the 4-month period from April to August 2004.

Our study revealed differences in call frequency between the medical and surgical pagers as well as expected differences during different shifts. While this information is useful for our hospital, its direct value to other organisations is potentially limited due to the confounding effects of variations in staffing ratios, patient volumes and patient acuity. For example, at Auckland City Hospital, 1.5% of medical admissions were elective whereas 39.9% of surgical admissions were elective during the study period.<sup>3</sup>

Most importantly, our research has very closely analysed the pager frequency for the seven pagers studied. Peak frequencies as high as one page every 7 minutes in both surgical and medical services is concerning. Indeed, multiple studies have shown that interruptions in work activity increase the processing time of task completion and increase the error rate when staff commence subsequent tasks.<sup>4</sup> In addition, interruptions and distractions have been shown to increase employee stress with multiple flow-on effects to patient safety.<sup>4-7</sup> Indeed, job stress is already a significant issue among junior doctors due to a wide ranging set of factors.<sup>8</sup>

Other studies have looked at pager frequencies in hospitals but it is difficult to draw direct comparisons due to differences in rostering practices and patient loads as mentioned above. Despite these limitations, our results appear similar to a study conducted among medical junior doctors in an urban tertiary hospital in the United States, which showed a mean medical pager call frequency of 12 minutes per call compared to our mean frequency of 23 minutes.<sup>9</sup> A similar comparison with Lurie et al<sup>10</sup> performed in three urban teaching hospitals showed a night time interruption rate ranging from 40–86 minutes which covers the mean of 50 minutes found in our study.

In addition, our study revealed wide variation in the frequency of calls to on-call house officer pagers, both by time and by specialty. It is well known that some hospital services are busier than others after hours, but the differences in work type mean that the call frequency alone does not accurately describe the workload.

For example, junior doctors working in ward-based or emergency areas can be extremely busy in one location and therefore not receive calls due to their constant attendance.

In addition, the reason for the call is important when assessing workload. For instance, a study performed at Auckland City Hospital looking at the quality of calls made to on-call house officers found that just 30% of after-hours calls were clinically indicated and required a response within 1 hour. A further 53% of calls were deemed clinically appropriate, but did not require a response within an hour and 17% of calls were considered inappropriate.<sup>11</sup>

Indirectly however, pager frequency can be a useful marker of job acuity and consequent junior doctor stress levels. Ideally, the after-hours workload should be shared to reduce excessive call frequency, with a reduction in the associated risks to patients and staff.

We believe that all hospitals should monitor pager frequencies as a surrogate marker of junior doctor workload and stress levels. While it is difficult to set a minimum safe call-frequency level, support systems should be developed for individual junior doctors as well as back-up roster systems for those that show consistently high call frequency.

Strategies to decrease the number of unnecessary calls to on-call pagers should also be developed, and (where necessary) a review of junior doctor staffing numbers should be instituted to ensure appropriate and manageable workloads.

At Auckland City Hospital, we will continue to monitor our call frequencies on a monthly basis; we have also developed a House Officer – Nurse Communication Policy. We hope that these developments will reduce call frequencies in our institution, with subsequent improvements in patient care and junior doctor morale.

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