



New Zealand's Christchurch Hospital at night: an audit of medical activity from 2230 to 0800 hours

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Abstract

Objective To audit medical activity at Christchurch Hospital New Zealand between 2230 and 0800 hours; specifically, to measure the volumes of tasks requiring completion overnight and to identify the competencies required for this as well as the level of teamwork that existed.

Design After a pilot study tested possible methods, Resident Medical Officers (RMOs) responsible for the care of adult patients at night were linked by a shift coordinator to recorders (mostly nursing students) trained to register the tasks performed, together with task urgency (as judged by the RMO) and duration. This information, checked each morning for completeness, was entered immediately into a database and analysed later. Telephonists logged all outbound calls through the hospital switchboard to on-call medical staff; theatre and admission records were recorded as usual. Anaesthetic and Radiology Registrar activity was self-recorded.

Setting Christchurch Hospital is a 650 bed tertiary centre, which covers most specialties.

Main outcomes In the absence of leadership, the RMOs were not working as a team. Consequently some were overextended while others were inactive. House officer tasks were largely generic—not specialty specific; there was no formal handover from the afternoon or day shifts and the level of hospital medical staffing did not reflect the activity levels over the time period studied. A review of the beep policy is urgently needed. A third of the admissions were to General Medicine, and basic medical activities (including admitting, reviewing, and prescribing drugs and fluids) for patients admitted under all specialties represented the majority of the night workload. Medical registrars had reduced some of the traditional multiple clerking by admitting patients themselves. The workload and its distribution over time was remarkably similar to that found at the 17 pilot sites in the United Kingdom, where Out of Hours Multidisciplinary Teams (OoHMT) were introduced.

Conclusion We recommend that Christchurch Hospital use these data to plan the composition and leadership of an OoHMT.

The challenge

Doctors' working times reforms (as introduced by the 1985 M10 determination in New Zealand (NZ)¹ and the European Working Times Directive (EWTD) in Europe in 2004) present a challenge for the provision of acute hospital services, especially at nights and weekends.

A joint statement, issued by the Academy of Royal Colleges, the British Medical Association, and the Joint Consultants Committee of the United Kingdom's National Health Service (NHS), expressed the challenge clearly:

New models of working are required to deal with the need to provide appropriate medical cover in acute hospitals where previously there were multiple tiers of resident junior doctors in multiple separate specialties.^{2,3}

The M10 determination changed the way in which doctors in training were employed and remunerated—from a fixed annual salary (with no restriction on hours worked) to salary bands based on hours worked with penalties for non-compliance.

New Zealand (NZ) was the first country to introduce working times reform in response to the general perception that resident medical officer (RMO) employment conditions were debilitating and stressful for doctors in training and potentially dangerous for patients. However, the need for changes in working practices to accommodate M10 and maintain services was apparent by 1987, when there were insufficient staff to fill the new rosters, and junior staff were no longer available out-of-hours to provide continuity of care, or hitherto high levels of service.^{1,4} This occurred because the reforms diminished the supply of doctor-hours to the service.

The NHS estimated that the EWTD would reduce the availability of doctors in training by 470,000 hours per week and Ireland estimated that 2500 additional non-consultant hospital doctors (NCHD) would be required, unless other options were followed.¹⁸

In theory, there are four ways of maintaining medical services, including:

- Do nothing but employ more doctors. NZ's persistence with this option alone (in the face of increased service volumes) has increased RMO requirements to the extent that 380 relievers are required to cover the leave of the much augmented RMO establishment, whilst the annual output of medical graduates from the two medical schools (Auckland and Otago) is only 300. Indeed, NZ is cited internationally as an example of the deficiency of this option when pursued without staff mix change;¹⁸
- Create a permanent non-consultant "career" staff grade, an option increasingly popular for work-life balance;
- A consultant-provided service, employing more consultants working in teams with clinical and non-clinical support, and significantly reduced numbers of NCHD, all in training programmes;¹⁸ and
- A combination of all of the above, with multidisciplinary teamwork, which is the approach being vigorously pursued in most developed countries.^{16,18}

For these reasons, new models of working in acute hospitals are just as necessary in NZ as in the United Kingdom (UK). Furthermore, experience has demonstrated that attempts to achieve compliance with the regulations (by simply inflating non-consultant hospital doctor numbers) destroys the apprenticeship model of training, is hazardous to patient safety,⁵ and results in imbalanced staff ratios.^{1,4} Responsibility for continuity tends to fall to senior staff, who also feel entitled to a contemporary work-life balance.

The solution to these problems requires a workforce willing to try new ways of working and accurate information about medical activity in the hospital.

The aim of this study

This study aimed to get accurate data about medical activity at Christchurch Hospital on the night shift (2230 to 0800 hours); this was necessary to identify the competences required of a night team, to gain information about the volumes of tasks requiring completion out of hours, and to assess the level of teamwork* that exists at present. Experience in the UK indicated that this was the first step if change was contemplated.

*“A team is a group of individuals who work together to produce products or deliver services for which they are mutually accountable. Team members share goals and are mutually held accountable for meeting them, they are interdependent in their accomplishment and they affect the results through their interactions with one another. Because the team is held collectively accountable, the work of integrating with one another is included among the responsibilities of each member.”⁶

At the outset of this research, night cover for adult inpatients was provided in the traditional tiered, compartmentalised way, based on specialties. There were four separate House Officer (HO) rosters and eight Registrar rosters, with no sharing of workload between disciplines or sometimes even between the tiers within disciplines.

Attempts at sharing workloads in a traditional collegiate way usually precipitated claims for “cross cover” and demands for the rewriting of job descriptions. RMOs’ assessments of “runs” suggested that the levels of support for them ranged from rudimentary to exemplary and that some junior staff feared that their prospects for promotion would be impaired if they asked for help.

Feedback from Christchurch RMOs raised concerns about the deleterious effects on patients and junior medical staff of traditional models of night-shift working which mirrored those of Dr Elizabeth Paice, Postgraduate Dean Director for London, who introduced the “Hospital at Night” model to the NHS.

After-hours Resident Medical Officer (RMO) workloads were not recorded, analysed, or understood. Anecdotes, generalisations and siloed thinking prevailed. Our study, modelled on NHS “Hospital at Night” pilot projects, used audit to measure medical activity at night.

Methods

The pilot audit—A 2-week pilot study (26 April–9 May 2004) of the 2230 to 0800 hour nightshift assessed possible methods of data collection, recording, and analysis. Tally sheets were developed for self-recording of activity by all RMOs in the hospital and on duty from 2230 to 0800 hours; Duty Managers reported exceptions such as inability to attend for duty; telephonists logged outgoing calls, and the nursing staff recorded medical activities in the wards. The objective of the pilot study was to assess compliance with the requirements of audit, assess the appropriateness of the tally sheets, and gauge their acceptability to the staff.

Pilot findings—The pilot demonstrated that some alternative methods would be necessary for the following reasons:

- Self-reporting by most RMOs on duty was incomplete and unreliable because recording task identification and start and finish times, whilst attending to duties and answering beeps, was not feasible in real time and retrospective reporting was inaccurate.
- The Radiology and Anaesthetic Registrars were also busy at times, but with more lengthy tasks requiring less documentation, which could be confirmed by objective data such as theatre records.

(The solution suggested by RMOs was to employ recorders to shadow the in-hospital staff primarily responsible for adult in-patient care at night.)

- Although demands on on-call staff not in the hospital were low, information was difficult to verify. (During the pilot study, only surgical Senior Medical Officers [SMOs] were called to the hospital, and those visits were usually captured through the telephonists' log or theatre records. Although information about the objectives and methods were widely disseminated, staff sometimes attributed their lack of information to inadequate notification and communication. The RMOs to be shadowed in the definitive study were individually advised about the proposed methods and the peer group provided with the opportunity to attend two briefings.)
- The large expected volume of information demanded a sophisticated database and if analyses were to be reliable, information from the tally sheets would require daily checking for completeness and transfer to the database.

(The expertise of Christchurch Hospital analysts solved these problems, however.)

The pilot study data from the Emergency Department, Intensive Care Unit, and Paediatrics Department suggested that staff in those teams were already sharing workloads in both a horizontal (between RMOs) and vertical (up the hierarchical ladder) way.

Definitive audit methods

- Audits focussed on the seven RMOs who are resident on the premises at night; they admit adult patients and provide immediate care for adult inpatients.
- Medical staff activities from 2230 to 0800 hours were recorded for 15 nights (Saturday 18 September to Saturday 2 October 2004). Two Medical House Officers; two Surgical House Officers; a General Surgical Registrar; a General Medical Registrar, and a Medical Registrar for the specialties of medicine (referred to as the Specialist Medical Registrar) were shadowed by recorders.
- The recorders (mainly nursing students) were linked at the start of each shift with the RMO they were to shadow by coordinators (senior nursing staff). The recorders were trained to record each RMO task on tally sheets, according to the classification shown in Table 1, together with the time required to complete each task. The task classification was based on information from the Royal Infirmary of Edinburgh and modified for local conditions with the aid of Christchurch RMOs.
- The radiology and anaesthetic registrars were provided with self-recording tally sheets made more appropriate as a result of the pilot experience.
- In addition to the personal contacts between the organiser and each individual RMO involved in the audit, a series of information sessions were held to address RMOs questions and discuss any concerns about the audit. To clarify their roles, training sessions were also provided for the recorders and the coordinators.
- Telephonists logged all outbound calls through the hospital switchboard, theatre and admission records were recorded as usual, and the duty managers were asked to report exceptions.
- A sophisticated database was established and systems were developed for prompt information management, including daily input from the tally sheets to the database.
- RMOs were asked to grade the urgency of each task, according to their judgement, as (1) should be done immediately; (2) should be done within the hour; (3) should be done anytime; and (4) could have been done during the day.

- The NZ Resident Doctors Association, the Association of Salaried Medical Specialists and the NZ Nurses Organisation were briefed about the audit.

Table 1. Task codes

Code	Task
P	Pain relief
C	Cannulation
D	Prescribe drugs
DC	Death certificate
F	Prescribe fluids
U	Assess urine output
CON	Assess confusion
DY	Assess dyspnoea
HY	Assess hypo/hypertension
B	Review blood results
REL	Talk with relatives
V	Venepuncture
A	Patient admission
PH	Telephone advice
R	Review patient
H	Handover
OT	Operating theatre
S	Search for equipment, documentation, and so on
O	Other—to be specified in task column

Results

Recorders were paired successfully with their respective RMOs on 103 of the possible 105 occasions, the tally sheets were checked for completeness daily, and the information from these sheets was transcribed into the database without delay.

Twenty-one individual RMOs (14 house officers and 7 registrars) served in the 7 posts studied during the audit. Their qualifications, countries of origin and levels of experience were typical of the overall Christchurch Hospital RMO workforce.

In debriefing sessions, the coordinators, recorders, and doctors described their experiences of the audit as interesting and rewarding.

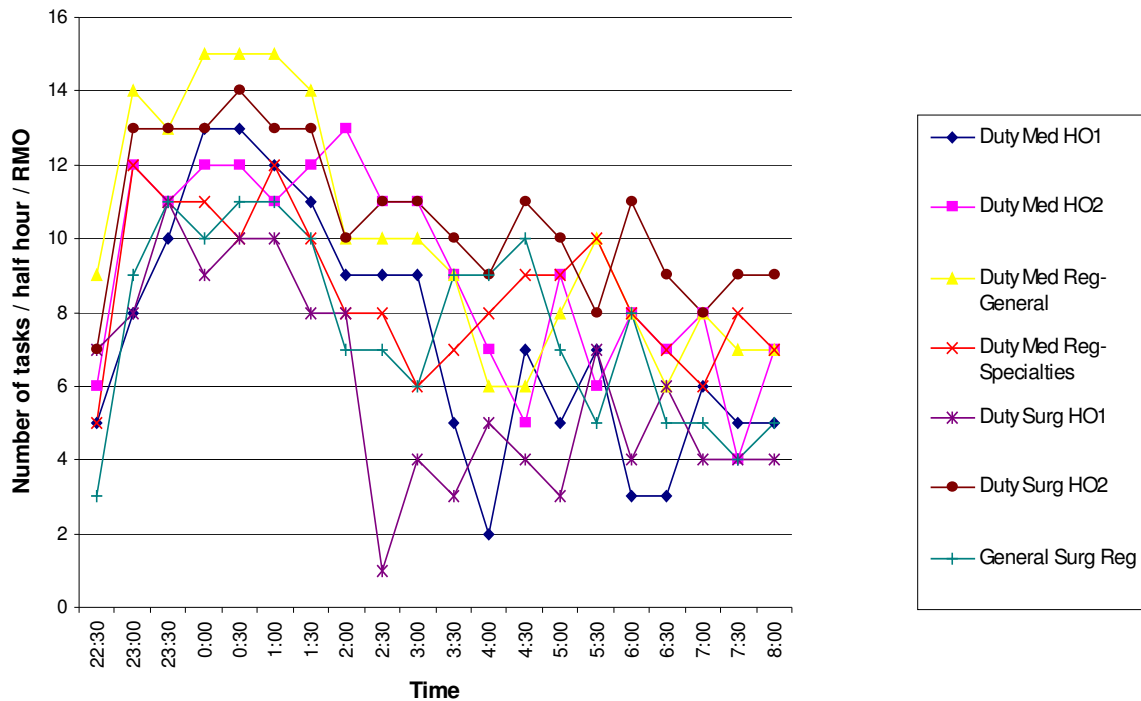
The number of tasks undertaken each night by the RMOs revealed no discernible pattern with respect to the day of the week. For example, the greatest number of tasks (319) were undertaken on the first Tuesday night whereas on the second Tuesday of the audit, the RMOs performed 154 tasks, the lowest of the audit. On the three Saturday nights in the 15-day audit period, 215, 277, and 154 tasks were undertaken respectively; variation consistent with the week nights. The absence of a pattern on particular nights allowed averaging of data across the audit period. Reviewing patients was the most frequent task, followed by the 'other' category in which the individual tasks were mostly paperwork.

Drug and fluid prescribing, patient admissions, telephone advice, and reviewing blood results each occurred over 15 times per night on average, while cannulation and

venesection was undertaken 16.5 times per night on average. Cunnulations and venesection are usually done by non-medical staff during the day.

There was variation between RMO types regarding the average number of tasks undertaken per night, although tasks undertaken by the house officers were similar, regardless of the discipline with which they were working.

Figure 1. Frequency of tasks performed by each type of RMO during their night shift (over the audit period: 26 April–9 May 2004)



Reviewing patients, fluid and drug prescribing, reviewing blood results, and searching for items of equipment/documentation (in particular) were the most time consuming tasks, followed by patient admissions.

The longest RMO task was a surgical operation, by the General Surgery Registrar.

The distribution of the RMO workload through the night demonstrated that there were wide variations in activity between RMO types at all times.

The RMO workload increased from the beginning of the shift, peaked at around 0100 hours, and steadily diminished from 0330 hours.

On no occasions were all seven RMOs simultaneously undertaking Grade 1 tasks, but during the 2 weeks of the study all seven RMOs were engaged simultaneously with Grade 1 and Grade 2 tasks on 16 occasions. The peak time was 0030 hours when there were five occasions on which all seven RMOs were engaged in a task—but after 0200 hours there were no instances where all RMOs were occupied at the same time.

Figure 2. Average percentage of RMOs engaged in an activity over time / night of audit. The error bars indicate the maximum and minimum variation at each time

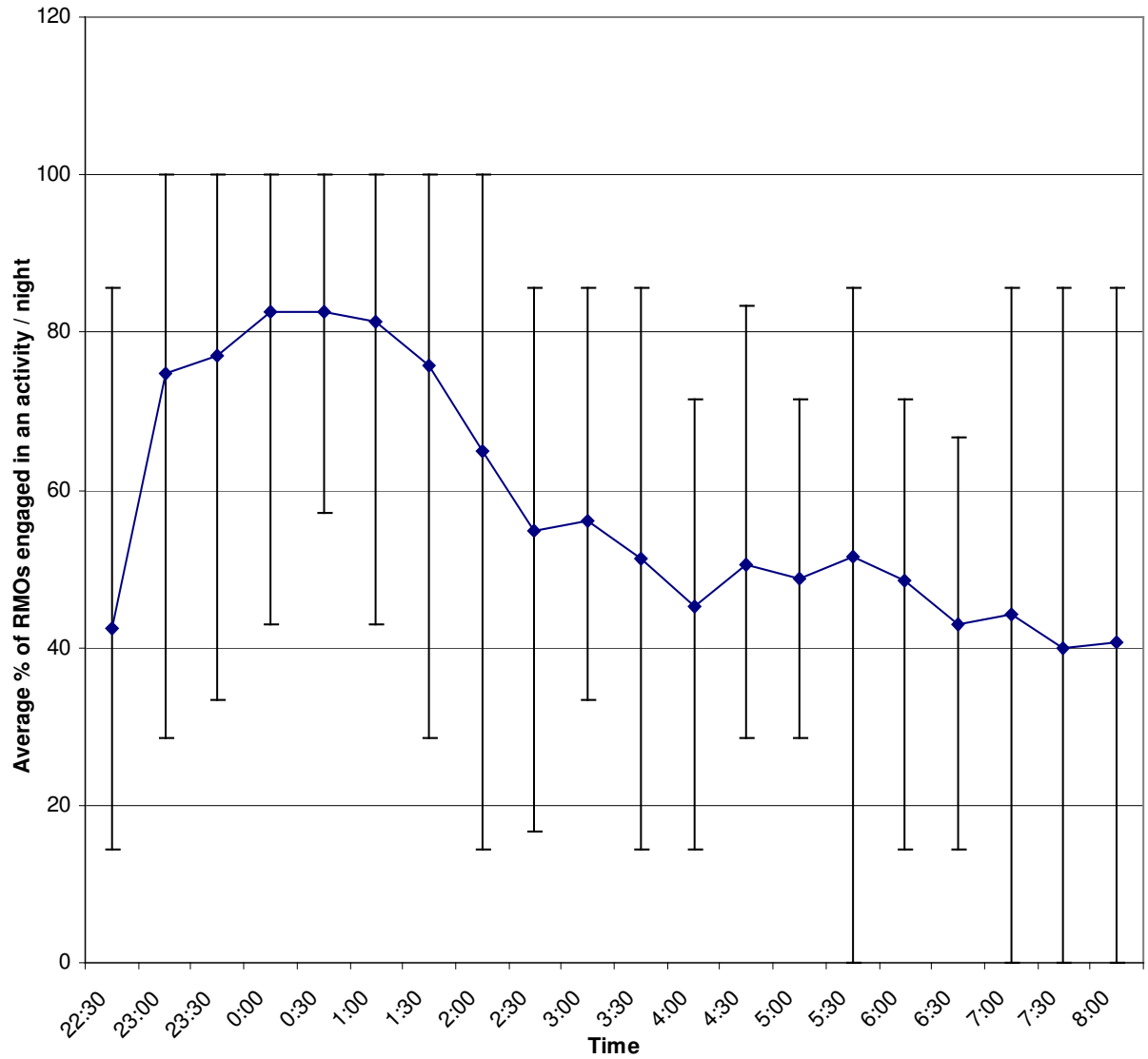


Figure 3. Total admissions to Christchurch Hospital over the audit period (26 April–9 May 2004)

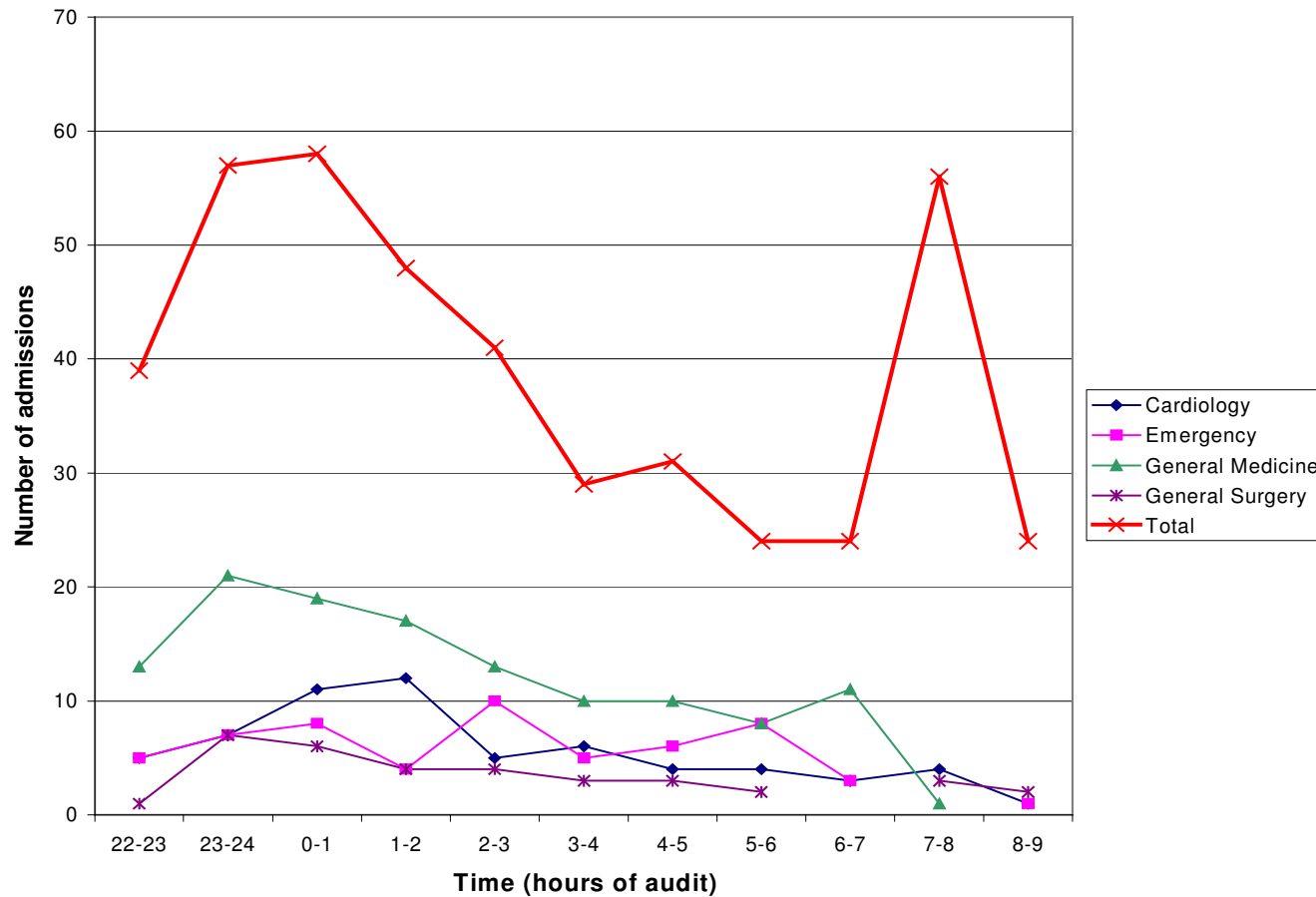


Figure 4. 406 Inpatient admissions at Christchurch Hospital by specialty between 2230 and 0800 hours over the audit period (26 April–9 May 2004)

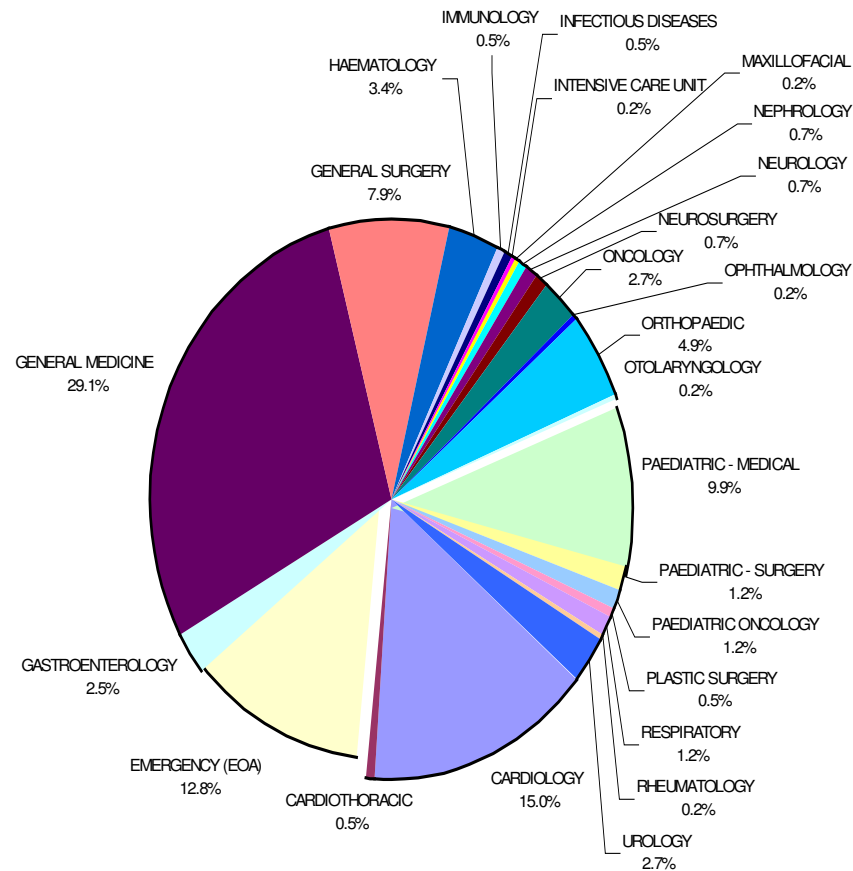
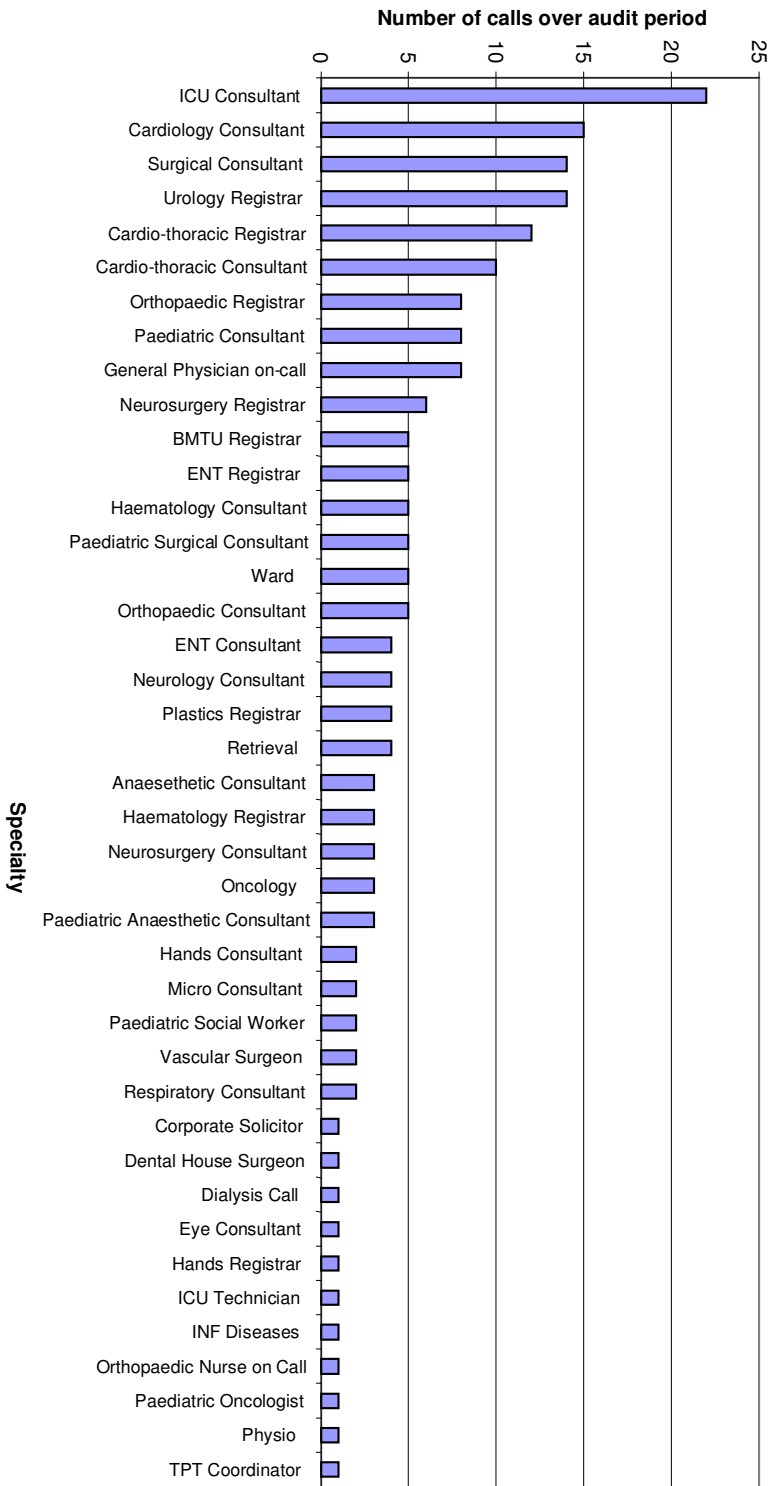


Figure 5. Telephone calls made to specialties



General Medicine received the most admissions (30%), followed by Cardiology (15%), the Emergency Observation Area (13%), and General Surgery (8%). Different RMOs managed paediatric admissions.

Specialty admissions arriving for surgery, chemotherapy, and so on (i.e. not night-team work) produced a 0700–0800 hour admission peak.

A few specialties received frequent calls to on-call staff but more than 50% of the specialties were called one in five nights or less. The ICU Consultant was called most frequently (22 occasions, 15 of which were from the ICU Registrar), followed by Cardiology (15 calls), then Surgery and Urology which both received 14 calls to on-call staff.

The General Surgical Registrar(s) was the operating surgeon in theatre for 14 hours over 15 nights, accounting for 45% of the theatre time used. Senior surgeons and anaesthetists attended all major and paediatric surgical operations and the plastic and orthopaedic surgical registrars performed operations on patients admitted earlier in the day.

The average number of beeps received by each RMO per after-hours shift is shown in Table 2.

Table 2. Number of beeps per RMO during after-hours audit

RMO	Average number of beeps per shift	Range
Duty Med 1 HO1	15	9 to 22
Duty Med HO2	12	5 to 21
Duty Med Reg Gen	7	1 to 11
Duty Med Reg Spec	10	4 to 33
Duty Surg HO1	12	3 to 20
Duty Surg HO2	12	7 to 20
Gen Surg Reg	5	1 to 11

Designations like Duty Med HO1 relate to areas of work, not years after graduation.;
 Duty Med Reg Gen=Duty medical registrar;
 Duty Med Reg Spec=Duty medical registrar for the medical sub-specialities;
 General Surg Reg=General surgical registrar.

Comparisons of hospital activity data with respect to admissions and bed occupancy revealed that the period under study was not unusual.

Discussion

Lack of teamwork—The seven RMOs in this study were resident in the hospital during the night shift with primary responsibility for admitting new patients and caring for all adult in-patients except those in Intensive Care. Their standing orders (job descriptions) identify each doctor as a member of a (vertical) hierarchical team—e.g. Surgery, Medicine, and Medical Specialties, without any reference to their overall responsibility to the hospital at night.

Through no fault of their own, these seven RMOs were not working as a team, as teamwork is defined above⁶ because that is a horizontal rather than a vertical model. Without overall leadership, some RMOs were (at times) overextended while others were inactive; there was no prioritisation of tasks across the specialties or sometimes

even within them,[†] and staffing levels did not reflect the changing workload during the time studied. Although activity levels are high in the evening and fall steeply after midnight, staffing levels do not reflect this change. At night, the pattern of the Christchurch Hospital workload is remarkably similar to that found in the UK.¹⁴

[†]There are incident reports of house officers being called by registrars two blocks away to sign prescriptions because “that is not registrar work.”

We welcomed the reduction in working hours and supported the aim for a better work-life balance through working times reform, but the consequences (including recruitment and retention challenges) of the reforms were very substantial. New contracts of employment are required for the provision of care “out of hours.” “Opportunities to match service-change with workforce-change exists, but that will require re-profiling of the workforce and an investment in training and education across the clinical professions.”^{10,22} In particular, new approaches are required to staff the “hospital at night.”

The shiftwork that is inevitable with working times reform in a 24-hours-a-day, 7-days-a-week service is inherently unhealthy but it can be made safer by attention to details. Indeed, matching staffing to workload is essential for staff and patient welfare and the massive downturn in activity after 0300 hours could permit shorter shifts, napping at night, and less night duty, which are believed to be in the best interests of staff and patient safety.¹⁷

Generic house officer tasks—Unlike registrars, although the number of tasks performed by each house officer varied somewhat, they were doing broadly similar tasks, utilising generic rather than specialty-specific skills. House officers rotate between specialties. For example, when house officers are on “relief” duties, they rotate between specialties and may be on medical duties some nights and surgical duties on other nights because the skills required of house officers are at a quite basic level, transferable across specialties.¹³

The designation ‘RMO’ (with sub-groups ‘house officer’ and ‘registrar’) is an anachronism that obscures tiers of competence that range from postgraduate year 1 (recent undergraduate), through postgraduate year 2, basic trainee registrar, and finally, after some years, advanced trainee registrar (about to be consultant).

Present-day consultants have often never met, let alone assessed, the competence of the house officer that they are “supervising” at night because there are so many and they change so frequently.⁵ Thus chance, rather than planning, has determined the range of competences in the hospital at night.

Although the workload was sometimes shared, registrars sometimes found it more efficient to admit patients at night rather than leaving it to the house officer, but either way ‘double clerking’ was eliminated.

Beep policy—A beep policy is urgently needed as beep distractions (averaging 12 and up to 33 times a night) are unreasonable. Indeed, unless this problem is solved, a “Hospital at Night” policy will fail. Principles have been established¹⁴ about who should hold a beep and who should have access to whom. In addition, a system is required at night to “filter” beep calls to the doctors, thus ensuring patient care is prioritised and ward staff are supported by the most appropriate member of the night team.

From the beginning of the night shift, calls to medical staff should be routed through the Clinical Night Coordinator,¹¹ with provision for calls requiring urgent attention such as cardiac arrest.

Calls to staff outside the hospital—The calls to specialties out-of-hours from Christchurch Hospital largely reflect the UK experience.¹⁴ When data about 8975 calls in 10 Trusts were analysed, it was found that 7% were for life- or limb-threatening reasons, 31% were for physiologically normal patients, and 62% for physiologically unwell patients.

In the UK, general medicine had twice as many calls as general surgery—but in Christchurch Hospital, out-of-hours calls to general physicians appear to have been discouraged. Anaesthetics, orthopaedics, and the medical and surgical sub-specialities generally received very few calls, except for intensive care physicians, who received the most.

Thus a few specialties were called nearly every night but more than 50% were called less than 1 in 4 nights and others were not called at all during the audit. In the UK where a large medical resource was allocated to covering hospitals between 2000 and 0800 hours, it is now recognised that most of this resource was either not used at all or was used inappropriately.

Handover hazards—The UK's Joint Consultants Committee states, "Handover arrangements must improve—before leaving the hospital in the evening, every junior doctor should have identified each patient's active clinical problems."²

Working times' reform makes formal handover between shifts mandatory because continuity of care becomes dependent on continuity of information, rather than continuity of the carer.¹⁵ Without a complete history—a physical examination, and a full assessment of a patient's problems—providing high-quality care is a problem for night staff when they become responsible for most of the patients in the hospital (because direct evaluation of each patient is not feasible).

Handover should identify acutely unwell or unstable patients so that early review can reduce the risk of deterioration overnight and reduce critical incidents. Relatively inexperienced staff should not have to prioritise and triage patients with limited or inadequate information. At the Royal Free Hampstead NHS Trust,⁷ every patient is reviewed by a specialist registrar between 1800 and 2200 hours, and at the weekends between 0900 and 2200 and graded A, B, or C (depending on the level of care needed). The grading, entered into an electronic database, is used as the basis for a properly structured hand-over to the night team. Formal handover (as general medicine has established in Christchurch Hospital for night to day transition) is even more important at 2230 hours.

The Out of Hours Multidisciplinary Team (OoHMT)—The Royal College of Physicians of London has reported how the 17 NHS sites which piloted hospital at night teams made progress³ in improving the assessment and admission of patients who presented to hospital with acute conditions. The established principles allow NZ to concentrate on solutions that satisfy them and local conditions, which may be very different for different hospitals. The College recommends an identified Out-of-Hours Multidisciplinary Team (OoHMT) with a physical "control centre" that allows a single point of call for all clinical problems.

Furthermore, a clearly identified leader should be vested with the authority to delegate and allocate work to all non-consultant doctors in the OoHMT and to call for assistance from outside the hospital when required. The College favours a medical leader working with a coordinator who “staffs” the control centre—but in some Trusts, a nurse coordinator leads the team.‡ At some pilot sites that had difficulty establishing medical leadership at night, the Medical Registrar faced most of the difficult clinical decisions and by default became the medical leader of the night team.¹¹

‡At Great Ormond Street Hospital for Children, a clinical site practitioner (nurse) leads the night team, chairs a formal handover, and assigns work in an organised way.⁹

This audit provides information about the volume of work for the OoHMT but the numbers required for the team will depend on ability to flex working hours to meet demand. To cover unusual contingencies, a “sleeper” (either based in the hospital or on-call) should be considered. The structure of the team will also be influenced by the extent to which some tasks such as venepuncture and cannulation are undertaken by non-medical staff.

Tenured staffing—Persistence with the traditional model of non-consultant employment after M10 inflated house officer numbers. Consequently, 222 UK house officers were employed temporarily (from 1–12 months) in Christchurch over the past 2 years in the attempt to achieve compliance with the regulations. These doctors were on a working holiday, not in training or tenured employment, and almost always intending to return home. Expanding the numbers of staff and doing more of the same does not automatically improve health care.¹² (Twenty percent of the annual output from the two NZ Medical Schools is now required to cover RMO leave in Canterbury.)

An OoHMT with tenured leadership has a stabilising influence that facilitates postgraduate training.⁹

As acute hospital services move progressively to specialist provision of services¹⁶ it will be necessary to train more specialists more efficiently. Since RMOs’ out of hour’s experience (under appropriate supervision and leadership) will be an essential training function, the OoHMT would enhance training opportunities.

Limitations of the study—Any calls made directly to staff outside the hospital were not captured.

The shadowing of RMOs from 2230 to 0800 hours and switchboard recording of calls to SMOs allowed more accurate workload assessment than was available for other times of the day. Were delayed patient journeys, from presentations earlier in the day, transferring work onto the night team?

According to the Institute of Medicine Committee on Quality of Health Care in America, “The loosely coupled but intricate networks of individuals, teams, procedures, regulations, communications, equipment and devices, that function within such diverse and diffuse management, accountability and information structures, make the term “health system” a misnomer.”¹⁹

Adverse events attributed to “systems errors,” remind us that: “Those organising and managing the health care system are responsible for creating and maintaining a system which provides safe, high quality care,”²⁰ but: “If we wish to make a dent in

the thousands of lives lost each year to unsafe health care, we need to do more health systems research.”²¹ Because there has been so little systems’ research there is much yet to be learned about process and methods.

Conclusion

Study of the provision of care “out of hours” demonstrated that we have an opportunity to match service-change with workforce-change. This will require a re-profiling of the workforce and an investment in training and education across the clinical professions.^{10,22} New approaches are required to staff the “hospital at night,” and the Out of Hours Multidisciplinary Team is recommended. The aim is not to lead to a more even distribution of tasks among fewer doctors but rather to ensure that sufficient appropriate staff are available at night, with leadership, to protect the patients and staff from harm.

Note: A more detailed report is available at:

<http://www.cdhb.govt.nz/communications/medical/Chc-Hosp-Night-240205.pdf>

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