The effect of a work design intervention on junior doctors: 
A collaborative approach to patient care

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ABSTRACT: Junior doctors play a pivotal role in Australian hospital based healthcare delivery. Despite widespread acknowledgement that junior doctors face stressful and demanding work conditions, there is a lack of research about how they might best be supported. This study investigates the effects of a work design intervention designed to reduce workload and enable junior doctors to more effectively use and develop their skills, whilst ensuring patient safety. The intervention involved the implementation of an advanced nursing role to support junior doctor during a period of their workday when they are most tired, and least supervised – the overtime shift. The study utilised a within-subject design to measure the effect of the APN’s support on the junior doctors’ workload and job characteristics. The results suggest that an APN working in collaboration with junior doctors’ has significant benefits for their workload and job characteristics, such as perceived support and opportunity for proactiivity and learning. The study also found differential effects of the APN intervention, depending on junior doctors’ experience and educational background. Overall, this study demonstrates that a small-scale work design change can have a significant impact on doctors’ workload and job characteristics and that collaborative practices can improve patient care.

Keywords: Change management, job and work design, work performance, individual learning
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The nature of hospital patient care is changing due to growing pressures from an aging population, technological changes and budgetary constraints. Chronic shortages of staff, increasing workplace violence and bullying, and problems with patient safety are just some of the symptoms (Buchan & Calman 2005; NSWNA, 2005). For example, results from the Quality in Australian Health Care study (1995) found that adverse events were associated with 16.6% of admissions, of which more than half were deemed to be highly preventable. This accounted for 8% of all hospital bed days in Australia in 1992, at a cost of over $2.2 billion. To face these evolving challenges, many hospitals are exploring new ways of delivering effective health care while keeping costs down.

This study focuses on an intervention introduced by hospital management on overtime shifts (after regular working hours) to reduce workload, increase support and reduce opportunity for error during a vulnerable time. The intervention was also designed to enable junior doctors to use and develop their skills and confidence more effectively. Junior doctors are a vital resource to hospitals, forming the base and often the face, of the pyramid shaped physician workforce. They deal with a multitude of patients with varying injuries and conditions, regularly work 15-hour shifts and are frequently the point of contact when the family are present in the evening. Despite this, they remain a relatively under researched group. The majority of studies have tended to focus on junior doctors’ work hours and schedules and the effects on their physical and psychological well-being (Baldwin, Dodd & Wrate, 1997; Bogg, Gibbs & Bundred, 2001; Jagsi & Surender, 2004).

Other important issues such as junior doctors’ skill development, confidence, self-efficacy and how they collaborate with other health professionals have received scant empirical attention. Moreover, there is a dearth of research examining the nature of patient care provided by junior doctors, despite increasing concern that many errors are caused by juniors doctors, working long hours and with at times limited supervision (Landrigan, Rothschild, Cronin & Kaushal, 2004; Chow, Szeto, Chan & Lui, 2005). In
particular, literature that describes controlled interventions to help develop junior doctors’ clinical skills and confidence, whilst ensuring patient safety is sparse.

This study investigates the effects of a work design intervention involving the implementation of an advanced nursing role, with the specific aim of providing greater support to junior doctors. The ‘advanced practice nurse’ (APN) took on some of the procedural activities performed by junior doctors, provided support by carrying out tasks that junior doctors had not yet mastered, and assisted with prioritising patients for the doctors. The APN worked during overtime shifts in which the junior doctors were responsible for up to eight wards alone, with often only occasional contact with a senior doctor. The implementation of the APN is expected to alleviate junior doctors’ work intensity (e.g., the number and complexity of tasks completed), perceived work and performance demands and to improve support and opportunity for skill use and proactivity. In addition to the practical benefits of this intervention, the findings from this study have important theoretical implications for the work design (Pierce & Dunham, 1976; Hackman & Oldham, 1980; Parker, & Wall, 1998) and work stress literature (Karasek, 1979).

Although there are a variety of expanded nursing roles, such as Clinical Nurse Specialist (CNS), Nurse Practitioner (NP), Certified Nurse Anaesthetist, and Certified Nurse Midwife (Hillier, 2001), a review of the literature revealed that there is no clear and consistent definition of “advanced” nursing practice both nationally and internationally. At the most general level, the American Nurses’ Association defined it as a nurse with a postgraduate degree. The Royal College of Nursing Australia (RCNA, 2000) defined advanced practice nursing more specifically as “a level of nursing that utilises extended and expanded skills, experience and knowledge in assessment, planning, implementation, diagnosis and evaluation of the care required”. Although there is no consistent articulation of the advanced nursing role, what is clear is that it incorporates new roles responsive to changing needs and expanding known boundaries of the nursing role in the interest of improved patient care. The current APN intervention is an example of this pioneering of new roles, involving the integration of leadership, consultation and collaboration skills to provide greater support to junior doctors.
There has been a variety of studies that explore the effectiveness of APNs on the clinical outcomes of patients, particularly in acute and critical care hospital settings (Benetar, Bondmass, Ghiteman & Boaz, 2003; Hoffman, Tosota, Scharfenberg, Zullo & Donahoe, 2003, 2005; Kleinpell and Gawlinski, 2006). The general finding is that the utilisation of an APN in the management of patients’ care provides benefits for both cost containment and health outcomes. For example, Ettner et al. (2006) estimated that an APN intervention conducted by Vazirani, Hays, Shapiro and Cowan (2005) led to a US$978 saving per patient. Brooten, Youngblat, Deatrick, Naylor and York (2003) investigated randomised trials of APN managed patients in five different research studies and found consistently fewer re-hospitalisations compared to the controls, and if re-hospitalised, were re-hospitalised for fewer hospital days at less cost. Similarly, Koppel (2003) investigated the effects of a partnership between APNs and doctors on high-risk seniors’ health outcomes and found reduced hospital bed stays for patients with the collaborative patient care (619-688 days) compared to the managed care average (1001 days). The findings from these studies suggest that the utilisation of an APN in the management of patient care can improve the outcomes for patients, reduce the costs of care and length of stay in hospital.

There is also evidence that APNs play a vital role in assisting communication and collaboration between doctors and nurses (Vazirani, Hays, Shapiro & Cowan, 2005). The study reported by Vazirani et al. (2005) involved comparing a multidisciplinary team, which included APNs and doctors, to a more conventional approach primarily consisting of doctor care. The study found improved communication and collaboration between doctors and nurses on the intervention ward. Specifically, doctors on the intervention ward reported significantly higher levels of collaboration with nurses than doctors on the control wards. Doctors in the intervention ward also rated their collaboration with the APNs higher than with other nurses. Nurses on the intervention ward also reported greater collaboration with the APNs than with the doctors. Additionally, doctors on the intervention unit reported greater communication between doctors and with ancillary staff, fewer unnecessary delays, and more timely responses from nurses. The study suggested that this may have been the result of the more structured multidisciplinary daily rounds or
it may have been a function of the increased time available to the doctors as a result of the duties being undertaken by the APN.

Regarding the working relationship between junior doctors and APNs, there is generally a dearth of research, particularly as to whether an APN may affect the work load, or support the learning and skill development of junior doctors. Studies have tended to focus more on the viability of APN care as a substitute for trainee doctors’ care (Hoffman et al. 2003, 2005), rather than emphasizing a collaborative partnership with trainee doctors. Given the clinical skills, experience and expertise of APNs, junior doctors may in fact benefit greatly by working more closely with an APN, particularly on overtime shifts when there is limited senior medical staff available to consult. In fact, there is evidence that the uncertainty of doing the right things and the consequence of failure are important contributors to junior doctors’ strain. For example, a recent longitudinal study of medical error by West et al. (2006) showed that self perceived medical errors were common amongst junior doctors, with one third reporting a major error. In addition, errors were also associated with decreased quality of life, increased burn out, depression and a decline in empathy over the following three months. Increased distress is also associated with increased subsequent errors, which suggests a vicious cycle (Bellini & Shea, 2005; Rosen, Gimmotty, Shea & Bellini, 2006).

Other studies have looked at junior doctors’ working conditions (e.g., the effect of long hours, high workload and emotional demands), and the effects of these conditions on their learning and clinical development. For example, a study by Baldwin et al. (1997) found that emergency admissions without the support of senior doctors and the need to carry out minor or menial tasks (e.g., need to fetch things from other wards) are two aspects of junior doctors’ work that contributes most negatively to their perception of effective learning and skill use. In a recent literature review, Thomas (2004) suggested restoring meaning to junior doctors’ time commitments and increasing their work control as ways to alleviate their burnout and improve the quality of patient care. There is need therefore for interventions designed specifically to enhance the performance, well-being and effective learning of junior doctors.
One intervention that may break the cycle of high workload, emotional demands and uncertainty for junior doctors is to provide the support, mentoring and opportunity for collaboration with a skilled clinician, during a period of their work day when they are most tired, and least supervised – the overtime shift. This research aims to determine whether the presence of an APN designed to support junior doctors during the overtime shift effects junior doctors’ workload (e.g., the number and complexity of tasks completed), and their perceived work characteristics (e.g., skill use, performance demands and perceived support). It was expected that this intervention would have positive effects in terms of alleviating junior doctors’ work intensity and improving their level of support and opportunity for development. In addition within the ranks of junior doctors there are particular groups who are most vulnerable, and who could benefit most from collaborative partnership with an experienced clinician such as an APN; interns (junior doctors in their first year of training) and overseas trained doctors (who may be unfamiliar with systems, cultural norms and specific practices in Australian hospitals). Not only could these two groups of junior doctors benefit in the short term, but there may be opportunities to set patterns of practice and support that enable these doctors to develop into more effective doctors in the future.

METHODS

Setting and design

This research took place in a large public teaching hospital in Australia during the overtime shift, from 5pm (at the end of the regular work day) to 11pm. After 11pm the overnight shift (using fresh doctors) assumes responsibility for patient care. During the day Junior Medical Officers (JMO’s) are allocated to a ‘team’ on a ward for a ten week term, where they are guided and supervised by consultants and registrars. JMO’s are rostered onto overtime shifts during specific teaching terms and are generally rostered onto 7 overtime shifts and 3 weekend shifts (9am to 11pm, Saturday or Sunday).

During the overtime shift, there are 5 JMO’s on duty with 2 interns responsible for wards that have relatively stable patients and the remaining wards are assigned to 3 RMO’s (Residents or JMO’s in their second or subsequent year of training). One Medical and one Surgical Registrar are on site to oversee and supervise the JMO’s, and they can access consultants on call. At the end of their regular work
(5pm) the JMO on duty, collects a pager and is then responsible for up to 8 wards, which they may or may not have had any prior contact with, until 11pm.

This research investigated an intervention and utilized a within-subjects design. The intervention consisted of the introduction of an Advance Practice Nurse (APN) to support JMO’s on the overtime shift. However with only sufficient funding to employ one APN, this person was only available for approximately half the overtime shifts, creating a naturally occurring field experiment. The study measured the effect of the APN’s support (presence) on the JMO’s workload and job characteristics. The design was counterbalanced as far as practically feasible (i.e. sometimes the APN was present in the first and sometimes in the second shift measured).

Sample

The participants consisted of 91 JMO’s and data was obtained over a period of 121 days from 192 shifts in total. The total number of matched shifts (i.e. the same JMO did the same type of shift under the same type of conditions with and without APN support) was 47. 54% of the JMO’s in the sample were female with 35% of the JMO’s in their first year of post graduate training (interns) and 65% being in their second or subsequent year of training (Residents). The average length of training at the hospital was 2.1 years (SD = 1.22, range 1-6 years). 65% of the sample had trained at Australian Universities and 35% were overseas trained doctors.

Procedure

After interviews with and shadowing JMO’s during the overtime shift a two part survey instrument was designed to capture the nature of the work and the experience of the JMO’s. The first part was a measure of JMO’s tasks and activity designed in conjunction with the Director of Clinical training for JMO’s. The measure utilized a self-reported task checklist and an electronic pager. The JMO’s recorded their tasks during the evening, and the method of obtaining the task (being paged or via self initiated ward rounds). At the end of their shift JMO’s recorded the number of electronic pages they received and the time they completed the task sheet to enable the number of tasks to be standardised
across all shifts. At the end of the shift the JMO’s also completed the second survey, which measured aspects of their job characteristics and support.

Based on the shift rosters, matching shifts were identified where a specific JMO would have the support of the APN or there would be no APN on duty. The order of these shifts was counterbalanced as much as was feasible. Contact was made with each JMO identified as meeting the criteria for the study (i.e. a matched shift – either with or without the support of the APN) at the beginning of the shift to alert them to complete a survey and task sheet during and after that evening shift. Initially each JMO was visited during the overtime shift and incentives were also used to encourage a good response rate. Towards the end of the data collection period JMO’s were alerted to the need to complete a survey via telephone contact at the beginning of their shift.

Due to the small number of JMO’s on any one shift (5) and the relatively small numbers of JMO’s rostered onto overtime shifts during a term (approximately 35), the research took place over four terms in total during 2005 and 2006. Participation in the research was voluntary, and if the JMO was unable to complete a survey on their designated shift, they were approached again, on the next matched shift. In follow up calls to JMOs there were several reasons cited for surveys not being returned; shift too busy, called into theatre/surgery, forgot and too tired. The total number of surveys handed out over this period was 332 (176 in 2005, 156 in 2006) and the total number of surveys returned was 192 (123 in 2005, 69 in 2006). The overall response rate per shift sampled was 58% and the participation rate for JMO’s was 89%.

There were several inherent problems with this research design. Firstly if a shift was particularly busy, the JMO’s tended not to have time to complete the survey. This suggests that the surveys that were completed may under report or not accurately reflect the tasks undertaken and may not capture the entire range of experiences on the overtime shift. At the same time JMO’s identified as ‘struggling’ were also not included in the study, as they were sometimes provided with additional support, and it was not appropriate to put them under additional pressure to complete the research documents. Secondly, the research was presented as an investigation into the experience of JMO’s on overtime shift. Whilst it was
not explicit that the research was investigating the effect of the APN, this was not disguised or manipulated in any way. Nevertheless personal contact with each of the JMO’s before their shift stressed the value of objective and honest responses on the task sheet and survey, and procedures were put into place to ensure that the manipulation was successful.

Measures

There were two major categories of measures: work tasks and job characteristics. The work tasks were measured using 1) a checklist of typical tasks JMO’s undertake during an overtime shift, developed by the Director of Clinical Training, 2) the number of electronic pages received and 3) self initiated ward rounds undertaken. At the simplest level we measured total number of tasks undertaken, pages received and number of self initiated ward rounds, standardised by hours on duty. However the checklist of tasks was also used to create several measures based on complexity (level of uncertainty, urgency and skills required) and protocol (whether JMO / APN can undertake the task). Low complexity tasks involved procedures, ‘non-patient’ reviews or ward duties (eg IV cannulation, writing up fluid orders) and high complexity tasks involved clinical reviews of patients (acute problems in stable or sick patients). Protocol based tasks were divided into three categories; APN permitted task (most procedures, eg IV cannulations), APN limited task (these are tasks which could be undertaken by an APN, but may need sign off from a doctor, such as clinical review of patients, non patient reviews, commencement of some treatments) and APN prohibited task (writing up medication charts, doses, admissions and discharges).

Job characteristics measures were based on established measures from the literature, with wording adapted to the context. Job characteristics included constructs such as perceived skill use (3 items, eg did you develop more confidence in your skills), work demands (5 items eg: did you have to work faster than you would like to complete your work) performance demands (2 items eg: Did you feel under pressure to prove yourself), opportunity for proactivity (2 items eg did you have an opportunity to be proactive) and perceived support (6 items eg: during this shift, to what extent have you felt supported / assisted by the following people…..) All items are rated on a scale from 1 (to no extent) to 5 (very large extent.)
PRELIMINARY RESULTS AND CONCLUSIONS

The first question is to what extent does having one APN, covering the wards that 5 junior doctors cover, make a difference to actual workload – number of tasks completed and types of tasks completed on the overtime shift. At the simplest level, actual work content was measured by the number of tasks undertaken, the number of pages received with requests for assistance and the number of self initiated ward rounds. A paired t-test showed no significant differences between these task measures for the same JMO on a shift with or without an APN (t=-1.49, n.s, t=-.89 n.s, t=-.66 n.s). Although interestingly there was a strong (within subject) correlation (r=.58, p<0.001) between the number of self initiated ward rounds undertaken with and without an APN, suggesting that some JMO’s are more likely to be proactive and initiate work, regardless of the support they are receiving, than other JMO’s. As there were no significant differences on the overall number of tasks, the next step is to look at the nature of the tasks being undertaken to determine if the presence of an APN impacts protocol based or complexity based tasks.

There are three categories of protocol based tasks, 1) *APN permitted* tasks, 2) *APN limited* tasks and 3) *APN prohibited* tasks. Tasks restricted to JMO’s based on protocol are not necessarily the more complex tasks however, and are often routine or paper based such as writing up medication charts, so a different breakdown of tasks based on level of complexity of the situation and skills involved was also used. There were two categories of complexity; low complexity tasks and high complexity tasks. Again using a within individual paired t-test, we found that JMO’s reported undertaking significantly fewer ‘*APN permitted*’ tasks when the APN was on duty (t=-3.23**). JMO’s reported doing significantly fewer cannulations, catheters, nasogastric tubes etc. However, as might be expected, there was no within individual differences in the number of *APN limited* tasks (t=-1.18 n.s.) or *APN prohibited* tasks (t=1.20 n.s.) between shifts supported or not supported by the APN.

Interestingly JMO’s reported doing significantly fewer *high complexity* tasks on the overtime shift when they are supported by the APN, than when they are not supported (t= -1.8*). At first sight this result appears counterintuitive as, having been freed up from the procedures being performed by the APN, it
might be assumed that the JMO’s would be taking on more complex tasks such as clinical reviews of patients. However during the overtime shift JMO’s respond to acute problems that arise rather than initiate new treatment. One of the initiatives introduced by the APN was to access a list of all the acutely unwell patients (eg transfers from ICU) on the wards prior to the start of the overtime shift, to review and assist in their stabilization. If this initiative were successful, one would expect fewer high complexity tasks. Thus, the fewer high complexity tasks when the APN is present could indicate that the initiative is resulting in fewer acute problems in patients. One tentative conclusion that can be drawn from this result is that the APN increases patient safety – because there are fewer ‘acute problems’ to respond to when the APN is on duty.

Another objective in introducing an APN on the overtime shift was to provide support to the junior doctors that have the least experience; the interns (JMO’s in their first year of training) and overseas trained doctors (who may be unfamiliar with Australian systems). It was expected that the APN would have the greatest impact on these two groups when compared to more experienced Residents (junior doctors in their second and subsequent years of training). The preliminary analysis showed that the interns (both overseas and Australian doctors) when on a shift supported by the APN, had significantly fewer overall tasks to complete compared to when they were on a shift without the APN (paired t= -3.36**) and significantly fewer of all types of tasks except APN prohibited tasks, (effect size, $R^2=0.15$). The fact that the APN support differentially affected tasks that can and can not be completed by the APN also strongly suggests that the measurement of the intervention is effective (i.e. the JMO’s were not deliberately manipulating the results, to increase the likelihood that the hospital would continue the APN trial). For the more experienced Residents there were no significant differences in number of tasks or type of tasks when the APN was on shift. The support of the APN had less impact on the work tasks of the residents than the interns.

Interestingly the residents within individual correlation between self initiated ward rounds on different overtime shifts is extremely high ($r=0.71**$). This strongly suggests that more experienced junior doctors develop a pattern of behaviour on overtime shifts, either tending to initiate ward rounds and
actively looking out for patients or tending to wait to be alerted to a problem. Interns on the other hand do not seem to have developed as strong a pattern of behaviour. This may be one area where the hospital can intervene early in the interns training, to encourage a more proactive approach to patient care on overtime shifts.

The second vulnerable group are the overseas trained doctors. Both Australian trained and overseas doctors, reported carrying out significantly fewer ‘APN permitted’ tasks, when the APN is on duty (t=-2.46*, t=-2.05*). The Australian trained doctors reported carrying out significantly more APN prohibited tasks (such as discharges, admissions, writing up medical charts and doses), when the APN is on shift than when the APN is not on shift (t=2.56*). However this difference was not present (t=0.04 n.s.) for the overseas trained doctors, although overseas trained doctors were doing more of these tasks in both conditions. This suggests that the Australian trained doctors increased familiarity with the system may mean that they increase the tasks that only they can do, when other tasks are being taken care of.

Having explored tasks the JMO’s undertake during an overtime shift, we next explored the effect of the APN on various job characteristics to determine whether this might provide some insight into the differences in tasks. For the JMO’s as a whole there were no significant differences when supported by the APN, on perceived skill use, work demands, performance demands and opportunity for proactivity. However when the group were split into overseas and Australian trained JMO’s, Australian trained JMO’s rated the opportunity for proactivity as significantly higher when supported by the APN (t=2.31*). This along with the finding that Australian trained JMO’s undertake more APN prohibited tasks when the APN is on duty, suggests that these JMO’s are taking advantage of the reduced procedural or APN permitted tasks to use their initiative and increase the tasks that can only be completed by doctors. Or alternatively that Australian trained doctors reduce the number of APN prohibited tasks, when not supported, whereas the overseas trained doctors do not.

All groups of JMO’s reported support from the APN as significantly higher when the APN was on shift (t=7.96**) and interns and Australian trained JMO’s reported feeling more supported by the Registrar (the on site doctor who has overall responsibility for patients on overtime shift) when the APN
was on shift ($t=4.26^{**}$, $t=3.21^*$). The first difference verifies that the JMO’s felt supported during a shift with the APN. The second finding may reflect the opportunities that the JMO has during the shift (when supported by the APN) to consult the Registrar and or the APN may be freeing up the Registrar to more actively support the JMO’s and / or the support from the APN may generalise to feeling supported by the Registrar.

In conclusion, the preliminary results from this research suggest that the support of an APN working in collaboration with JMO’s on overtime shifts has significant benefits for both the JMO’s, and the patients in their care. The organisational change had significant effects on the nature of the work JMO’s undertake and increased their perceived level of support. In addition the results tentatively suggest that the presence of an APN reduces the occurrence of acute problems in patients during overtime shifts. The results also highlight that the intervention may have differential effects on JMO’s depending on their background and experience. Specifically, APN support has differential effects on novice and experienced workers. Residents who are experienced report increased opportunity for proactivity, which appears to translate into increased tasks that only they can complete. This does not happen with the inexperienced, or culturally unfamiliar groups. They may not be as able to take full advantage of the additional support provided by the APN. The research also identifies specific areas where training may set effective patterns of practice for interns. Overall, this study demonstrates that a small-scale work design change can have a significant impact on doctors’ workload and job characteristics and that collaborative practices can improve patient care.
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