

# Structured approach in improving weekend handovers in a medical high dependency unit

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## Abstract

Weekend admissions to hospital have been associated with adverse patient outcomes, including higher morbidity and mortality risk in general medicine and surgery. The reasons behind this are likely to be multifactorial and include reduced senior clinician-led care, decreased overall workforce, and ineffective or incomplete handover. With the advent of shift-work patterns, robust handover between medical teams is of paramount importance, particularly before weekends. This has been reflected in recent publications by Royal College of Physicians (acute care toolkit 1: handover, May 2011), that identified handover as an error-prone process and issued guidelines designed to optimise its effectiveness.

The aim of this project was to evaluate weekend patient mortality and success of handover on the medical high dependency unit of a large teaching hospital in the United Kingdom, before and after introduction of a structured handover tool on Friday afternoons during May 2013. This unit is registrar-led at weekends. Weekend mortality decreased from 43% in March 2013 to 22% in May 2013 (odds ratio 0.37, 95% CI 0.19-0.68,  $p=0.07$ ). Documentation of resuscitation status and escalation plans increased from 75% in March 2013 to 93% in May 2013. There was universal positive feedback from registrars involved with the handover tool, who provided senior cover during the weekends in May 2013. It is hoped that structured, written handover will ultimately become commonplace in this unit and will improve patient safety at weekends.

## Problem

The medical high dependency unit (MHDU) at the Queen's Medical Centre consists of eight level 2 beds (in which the patient to nurse ratio is 2:1; patients may have central venous access for inotropic support, and arterial lines for regular blood gas monitoring), and four level 1 beds (patient to nurse ratio 4:1; these patients are generally considered fit for step-down to a medical ward). The MHDU is run out-of-hours and on weekends by the on-call medical registrar, who also covers acute medical admissions and the coronary care unit. The majority of weekend registrars have not worked on the unit during the week, and are therefore unfamiliar with the patients and their clinical progression. This correspondingly makes treatment decisions and escalation plans over the weekend more difficult to evaluate, especially under selective pressure from other critically ill patients in the hospital.

Weekend and weekday mortality were audited in the MHDU over March 2013, and it was found that 43% of all deaths occurred during weekend hours. Lack of direct consultant cover, coupled with variable quality of weekend handover, are considered to be potential causes for this. One particular concern highlighted by registrars locally was inadequate documentation of patients' resuscitation status and plans for escalation to intensive care if required. The Royal College of Physicians and Royal College of Surgeons have produced guidelines recommending that 100% of patients should have resuscitation status documented in written handover for on-call teams.[12, 13] However, an audit of all patients present on a Friday afternoon ward round during the month of March 2013 found that resuscitation status was only clearly documented in 36 out of 48 cases (75%) on the MHDU.

## Background

Nationally, there is increasing evidence to suggest that weekend admissions are associated with higher patient mortality in both emergency and elective settings, compared with admissions during the week.[1,2] In one recent multicentre, retrospective study involving over four million emergency admissions across the UK, overall adjusted odds of death were 10% higher in patients admitted as emergencies during weekend hours.[3]

The cause for higher weekend mortality on general medical wards is likely to be multifactorial, although significantly reduced (or even absent) consultant presence is widely cited as a contributor [4]. One convincing line of evidence to support this hypothesis comes from assessment of weekend mortality on intensive care units (ICU), where direct consultant input and a shift-working pattern are well established. Wunsh and colleagues (2004) found that after adjustment for casemix, day of the week, and time of admission were not associated with significant differences in patient mortality in ICUs across the UK.[5] Similar findings have been reported in international studies, including data from France, Taiwan, and the USA.[6, 7, 8]

Another factor that potentially impacts on weekend mortality rates is the quality and effectiveness of handover. It is widely established that handover on general medical wards is variable in its quality and depth. It is therefore inherently prone to error, and inconsistent handover may present a genuine threat to patient safety.[9, 10] Indeed, a recent audit cycle published by the Royal College of Physicians demonstrates that written handover (ideally in electronic format) improved communication of quantitative measures such as

patient resuscitation status, investigations, and management plans to the weekend team [11].

A quality improvement project aiming to strengthen weekend handover for the covering clinician was implemented for four successive weeks, with patient mortality and rate of documentation as primary and secondary outcome measures respectively. A weekend handover checklist was developed in April 2013 and was introduced every Friday in May 2013 on the afternoon ward round at 16:00, at which the covering registrar for that weekend was present. This project review describes the effect of a structured weekend handover chart on patient mortality, documentation of resuscitation decisions, and registrar experience on MHDU at weekends.

## Baseline measurement

A Pre-intervention audit in March 2013 performed on 48 cases present during the month on Friday afternoon ward rounds established that resuscitation status was clearly documented in only 75% of cases. This was performed by evaluating patient notes individually specifically looking for the criteria outlined by the Royal Colleges on patient handovers.

During March 2013, 43% of all deaths occurred at weekends. A structured handover tool incorporating escalation decisions was designed and implemented on Friday afternoon consultant-led ward rounds to guide weekend patient management (appendix 2). Outcome measures included documentation of resuscitation status as well as patient mortality.

See supplementary file: ds3381.doc - "Appendix 1 and 2"

## Design

Patient mortality rates were calculated over the month of March 2013. During this month, there were 97 admissions to MHDU and 16 deaths in total (mortality rate 16.5%). Weekend mortality was found to approach weekday mortality in absolute terms (seven weekend deaths in total, nine weekday deaths), ie 43% of all deaths occurred on a weekend. A 'weekend' was defined as the time period from Friday evening (17:00 onwards) to Monday morning (until 09:00) or Tuesday morning in the case of bank holidays.

Six medical registrars who regularly cover the unit undertook a brief questionnaire to highlight areas of inadequacy regarding handover and patient management over the weekend (appendix 1). Specific areas highlighted as requiring attention included:

- Inconsistent and occasionally absent plans regarding resuscitation status and escalation from the weekday team
- Lack of time to check and regulate frequency of investigations such as blood tests (usually undertaken by the on-call junior doctor) and imaging
- Lack of clarity as to working diagnosis, active issues, and

management plans for the weekend team.

A weekend handover checklist was correspondingly designed to address the above factors (appendix 2). This handover chart specifically focused on the working diagnosis, active clinical issues, blood tests required over the weekend, relevant imaging performed, invasive lines in place (ie central or arterial lines) and plans for escalation and resuscitation status.

The weekday team were briefed every Friday morning about completing the forms at the afternoon ward round (16:00) at which the weekend registrar would be present. Junior doctors from the weekday team completed the forms, which were then filed in patients' medical notes for reference by the weekend team.

An audit was subsequently undertaken to evaluate patient mortality, rate of documentation of resuscitation status, and registrar experience over the month of May 2013 (including four weekends), during which the written checklist was in operation. The Fisher's exact test was used to evaluate statistical significance of the data obtained regarding patient mortality.

## Strategy

The initial weekend handover tool designed focused on patient demographics, clinical details, resuscitation, and potential management options including blood tests, relevant imaging, and airway maintenance. However, after initial implementation, verbal feedback from the clinical registrars involved suggestions to include specific interventions related to the high dependency unit. These included the presence of invasive lines (Arterial, central, and CVP), details of inotropic support, MAP parameters and urine output documentation. These were subsequently incorporated in the final handover tool resulting in higher satisfaction rates from the same cohort of HDU registrars.

The form was initially designed to be completed by the consultant doing the latest Friday afternoon ward round as decisions to be documented on the form would have to come from them so their documentation would be ideal to exclude interpretation errors. However, this did not turn out to be feasible and instead the intervention turned out to work more effectively with the junior doctors completing the form on verbal orders from the consultant in charge. This ensured that no boxes were missed as they would adequately prompt the senior hence avoiding the issue of incomplete forms. Once the above issues were addressed, the intervention was uniformly implemented and evaluated.

## Results

Quantitative results

From 1st May to 31st May 2013, there were 72 admissions to the MHDU. Weekend handover sheets were completed for 100% of patients every Friday afternoon on the ward round. In total, nine patients died on the unit, reflecting an overall mortality rate of 12.5%. Only two deaths occurred during the weekend, giving a

weekend mortality rate of 22.2% (figure 1). One further death occurred on the evening of Friday 24th May, but this was expected and was considered imminent, and the patient in question was placed on the Integrated Care Pathway prior to handover of care to the weekend team. This patient's death was therefore not counted within the analysis.

Post intervention re-audit thus demonstrated a decrease in weekend mortality by 21 percentage points (43% in March 2013 versus 22% in May 2013). The crude odds ratio for this data was 0.37 (95% confidence interval 0.19 - 0.68),  $p=0.07$ . Resuscitation status and escalation plans were made for patients present over the weekend in 42 out of 45 cases (93.3%) in May, versus only 36 out of 48 cases in March (75%, figure 2).

## Qualitative results

The eight medical registrars (four during day shifts, four during night shifts) covering MHDU during weekends in May 2013, which saw the implementation of the formal weekend handover tool, were questioned as to their opinions on its influence in managing weekend care. The chart was considered to be a positive asset in 100% of cases, with six out of eight (75%) registrars citing the documentation of escalation plans and resuscitation status as the main constructive element in influencing weekend management (figure 3). The remaining registrars cited the following as greatest benefits of the checklist:

- Clear documentation of the working diagnosis and management plan
- Airway management documentation (eg tracheostomy details and plans for decannulation, type of non-invasive ventilation and parameters).

Other unanimous positive feedback included the checklist of blood tests required over the weekend. Five registrars (62.5%) felt that the box depicting blood gas analysis was not necessary and could be removed to increase speed of completion of the chart.

Junior doctors from the weekday teams completing the checklist reported that it was easy to complete and did not interfere with writing management plans in the patients' medical notes. Indeed, in 20 out of 45 cases (44%) the weekend checklist was used as the only written documentation of the Friday afternoon ward round. The three consultants covering MHDU during this time period also felt that its use was beneficial to patient care over the weekend hours.

## Lessons and limitations

### Discussion

In May 2013, the BMJ published alarming evidence from investigators at Imperial College London, demonstrating that patient mortality after elective surgery was increased by 44% for operations carried out on a Friday, and 82% for procedures performed on a weekend [14]. Reduced senior staffing levels were cited as a potential reason for this observation, along with the well-established

nature of post-operative complications, which tend to occur within 48 hours of surgery. This report adds to a wealth of evidence indicating that skeleton staffing at weekends is a potential threat to patient safety, due to inadequate cover and lack of senior input. This paradigm is just as relevant in general medicine, with studies reporting that patient outcomes suffer during the weekends due to lack of acute intervention in conditions such as stroke and myocardial infarction.[15, 16] In the light of increasingly damning evidence which suggests that the status quo is unacceptable, the argument for better continuity of care, including increasing numbers of senior staff at weekends, is compelling and gains credence.

As junior doctors, the ability to effect change on a large scale is limited, due in part to lack of authority and experience, but also absence of control over resources and the demands of clinical practice. However, the need for effective leadership is paramount in an NHS that is witnessing tumultuous change. The ability to lead at all levels has thus become a necessary tool in any doctor's working artillery. The BMJ advocates so-called 'little 'l' leadership' as an approach through which junior doctors may effect change in their working environments by 'creating consensus, modelling behaviour, articulating vision and asking questions.' [17] As a junior doctor training in internal medicine, the option of tackling weekend mortality rates by increasing consultant staffing at weekends was not viable. I therefore chose weekend handover as a potential source for intervention. There is abundant literature to indicate that inadequate handover is not only widespread, but is associated with compromised patient safety, especially with the advent of ubiquitous shift-work patterns resulting in on-call teams who do not know the patients they cover.[18] Robust patient handover is therefore essential for weekend staff, and may contribute towards minimising adverse events at times when the workforce is reduced.

The aim of introducing a formal weekend checklist for handover on the medical HDU was to assist covering medical registrars in patient management over the weekend. While the ultimate goals of reducing patient mortality and optimising patient care during these time periods are likely to require multifactorial intervention, improving handover was a quality improvement project which could easily be implemented at a junior doctor level, and which may have an independent contribution towards maintaining patient safety.

The audit cycle demonstrated a reduction in weekend inpatient mortality in May compared to March 2013, and improved compliance with documenting resuscitation status and escalation plans over the weekend (93% in May versus 75% in March). Although the weekend reduction in mortality was not statistically significant ( $p=0.07$ ), the small sample size and presence of confounding factors necessitate further audit to demonstrate the true independent effect of the handover tool on patient mortality.

Use of the checklist was validated by registrars over the four weekends, all of whom gave positive feedback, particularly regarding documentation of resuscitation decisions. Consultants covering MHDU were directly questioned regarding patients' resuscitation statuses on a Friday afternoon in order to complete the chart, and do not attempt resuscitation (DNAR) forms were signed as appropriate, whereas prior to the current intervention, this

step occurred less consistently. Having firm decisions in place, which were consultant-led, improved registrar confidence and resource allocation, as discussions regarding escalation of care were made with patients in a controlled fashion during the week, rather than at weekends in suboptimal circumstances.

## Limitations

The cause for such a substantial reduction in weekend mortality during May 2013 compared with March 2013 is highly likely to reflect multiple dimensions of care and patient demographics; it cannot be solely attributed to the introduction of a weekend checklist. For example, it is widely established that seasonal variation for conditions which carry a high mortality risk (eg biventricular failure [19], myocardial infarction, chronic obstructive pulmonary disease [20]) are such that exacerbations tend to occur during winter months, with greater inpatient admissions during this time. Of note, the majority of inpatient admissions to MHDU during March 2013 were due to type 2 respiratory failure in the context of COPD exacerbations (60% of patients), whereas a bigger case mix was observed in May 2013, including a higher number of admissions for more easily reversible pathologies such as diabetic ketoacidosis. Another potential confounding factor is patient age and comorbid status. On average younger patients were admitted to the unit in May 2013 (average age 57) compared with March 2013 (average age 64.5), which together with a greater number of admissions for easily reversible pathologies would inevitably have contributed to the reduced overall and weekend mortality rate observed during this month.

Other confounding factors which may have influenced patient care over weekends, but which were not directly measured in this study, include seniority and speciality of the covering medical registrar and seniority of the junior doctor covering the unit. Respiratory pathology remains the most common cause for admission to the MHDU, and thus a registrar specialising in respiratory medicine may be able to provide acute services that improve patient outcome over the weekend, for example ultrasound-guided intercostal drain insertion for complex collections such as empyema or loculated pleural effusions. On a similar note, more experienced registrars (in any speciality) would presumably be more proficient in time management and procedural intervention. Thus, patient assessment and management may be more thorough, referrals to other specialties (eg renal services, intensive care) may be swifter, and resource allocation may be more fluent, with a registrar nearing the end of their training, compared with more junior registrars.

Experienced junior doctors, nearing their registrar training, may also contribute towards more effective resource allocation, as many are independently competent in procedural skills required on the MHDU, such as central venous access and arterial line insertion. The presence of a more experienced junior doctor may therefore allow the covering registrar to focus on acutely ill patients and instigate definitive management immediately, rather than supervising procedures.

## Future directions

Development of electronic handover systems has become increasingly popular in recent times.[21] The dynamic nature of such a list has clear advantages in that it lends itself to 'live' updating, as well as providing a secure and potentially more accurate platform for exchanging patient information between on-call teams. However, the infrastructure necessary to allow fluent and secure electronic data transfer is not readily available in most NHS institutions. Although electronic handover format is in place across some medical and surgical firms, the extremely high turnover in medical HDU, as well as a paucity of available computers, has rendered its potential use impractical at the current time. In future, the anticipated surge in electronic health record keeping would potentially allow for the launch of effective electronic handover through increased availability of resources and security systems in place to ensure confidentiality of patient data.

## Conclusion

The clear increase in patient morbidity and mortality over weekend periods is a phenomenon observed globally, particularly in health care systems with reduced senior input out-of-hours. In the light of recent evidence published in the BMJ, weekend mortality is the subject of a national forum led by Sir Bruce Keogh, the results of which may transform out-of-hours medical care by improving senior staff presence.

Another facet of maintaining strong medical standards and ensuring patient safety is effective handover to on-call teams. In this local quality improvement project, development of a structured weekend handover tool for patients in the medical high dependency unit was associated with greater registrar satisfaction and improved compliance with national guidelines on written handover, particularly with respect to patient resuscitation status. Assessing the independent effect of the handover checklist on reducing patient mortality would require a longer trial period with more robust auditing of the potential confounders discussed. Future directions include transfer of the written handover into electronic format, with a dynamic 'live' patient list available for continuous updating. The regular implementation of a formal weekend handover chart may also be extended to acute admissions, although high patient turnover could present a challenge to its implementation in this clinical context.

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## Declaration of interests

Nothing to declare.

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