



Clinicians' Perception of the Preventability of Inpatient Mortality.

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Abstract

Objective

The objective was to assess whether clinicians have an accurate perception of the preventability of their patients' mortality. Case note review estimates that approximately 5% of inpatient deaths are preventable.

Design

Prospective audit of inpatient mortality.

Setting

A single NHS Hospital Trust.

Cases

An audit of 979 inpatient mortalities.

Outcome Measures

A number of outcome measures were recorded. These included a Likert scale of the preventability of death and NCEPOD based grading of care quality.

Results

Clinicians assessed only 1.4% of deaths as likely to be preventable. This is significantly lower than previously published values ($p < 0.0001$). Clinicians were also more likely to rate the quality of care as 'good', and less likely to identify areas of substandard clinical or organizational management.

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5 *Conclusions*
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7 There is a wide disparity between independent case note review and
8 clinicians assessing the care of their own patients. This may be due to a
9 'knowledge gap' between reviewers and treating clinicians, or an 'objectivity
10 gap' meaning clinicians may not recognize preventability of death of patients
11 under their care.
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23 Keywords (MeSH): Mortality, Hospitals, Clinical Audit, Quality of Healthcare,
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Introduction

It is an unfortunate, but undeniable, fact that unnecessary deaths occur in hospitals throughout the world. In the UK, the reporting of Robert Francis' Report of the public inquiry into the medical care within the Mid Staffordshire NHS Foundation Trust (UK Department of Health, 2013), has led to close examination of hospital mortality rates. Elevated mortality rates were a key indicator in the eventual identification of the failing standards of care in this trust. Standardised mortality ratios provide a crude, but objective and important measure of care quality.

An important question this inquiry has raised is how the hospital trust and its clinicians could largely disregard consistently high mortality.

Due to the fallibility of clinicians and the structures in which they work, preventable errors, morbidity and eventually mortality occur. The extent to which this happens is debatable. The Chief Medical Officer estimates that in the UK, 255,000 patients suffer disability, serious harm or death each year as a result of healthcare interventions (UK Department of Health, 2000). Yet iatrogenic harm is not always considered preventable. Operations such as elective aortic aneurysm repair have a recognised mortality rate, and death after such an operation would not summarily be regarded as preventable.

Unnecessary or preventable deaths are usually determined by independent retrospective case notes review. Whilst there is evidence from Hayward *et al*

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3 (2001) and Zegers *et al* (2009), indicating that there is a subjective element to
4 these assessments, they are nevertheless thought by Lilford *et al* (2007) to be
5 the best available tool to make assessments in these, frequently complicated,
6 cases. Studies from Hayward in the US (1993), Zegers in the Netherlands
7 (2010), and Briant in New Zealand (2006) have estimated that between 3.4%
8 and 6% of deaths were preventable or due to preventable errors. These
9 values were verified by a larger recent UK study by Hogan (2012), in which
10 5.2% of 1000 deaths in 10 acute hospitals were judged to be preventable.
11 This study also showed that those preventable deaths were more prevalent
12 among those patients who had a greater life expectancy than those patients
13 with a lower life expectancy.
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30 When considering more general issues of care in patients who have died, a
31 large nationwide study conducted by the National Confidential Enquiry into
32 Patient Outcomes and Death (NCEPOD, 2009) has selected a number of
33 indicators. Deaths in Acute Hospitals: 'Caring to the End' considered areas in
34 which compromised care affected patient mortality. This study also used case
35 notes review and, whilst not focusing on the proportion of preventable deaths,
36 felt that almost 40% of patients who died, had areas of their clinical or
37 organizational care in which there were one or more areas for improvement.
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49 We approached this question from a different perspective. Clinicians
50 intimately involved in the care of patients will have a professional, detailed,
51 and thorough knowledge of their care. Furthermore, they will be aware of any
52 clinical issues not documented, subtle impressions about patient progress,
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3 and administrative obstacles that may have impeded patient care. However,
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5 these clinicians will not have the same independent, disinterested approach to
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7 these cases, and they have not been formally trained in case note review. We
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9 therefore audited our clinicians on their perception of the preventability of all
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11 inpatient deaths over a 14-month period.
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14 15 16 **Methods** 17

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20 The trust comprises of three acute hospitals providing medical care to a
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22 population of around half a million and a specialist cancer centre serving a
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24 population of over one million. The trust sees 130,000 A&E attendances, and
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26 71,500 elective and emergency admissions a year to over 800 inpatient beds.
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28 The average stay for emergency admissions is 5.5 days, and for elective
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30 admissions is 2.8 days.
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35 The Hospital Standardised Mortality Ratio for our trust was 102.1 and 99.5
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37 during the study period (NHS mean is 100). This indicates that our institution
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39 sees approximately the expected amount of inpatient mortality. This makes
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41 our trust a representative centre when assessing care quality, particularly
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43 from a perspective of patient mortality.
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49 We audited mortality in our trust in an effort to identify areas in which care
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51 quality could be improved. Neonatal patients were excluded. As part of this
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53 audit, we used a modified Likert scale to ask clinicians whether they thought
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55 the death was preventable. The available responses were a) not preventable
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3 (chance of survival with optimal management 0-25%), b) unlikely to be
4 preventable (25-50%), c) likely to be preventable (51-75%), d) highly likely to
5 be preventable (76-100%), and e) no idea. Clinicians were also asked to what
6 extent good practice was followed. A grading system from the NCEPOD
7 'Caring to the End' report was used. Clinicians were asked whether the
8 patients care was best described as a) good practice, b) room for clinical
9 improvement, c) room for organizational improvement, d) room for clinical and
10 organizational improvement, or e) less than satisfactory.

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12 Patient demographics, cause of death, and the expected nature of the death
13 (i.e. the patient was on the Liverpool Care Pathway (LCP)) were recorded. In
14 those patients with unexpected death (not on LCP), details of care, and
15 details of areas in which care could be improved were also sought. This was
16 completed with a structured questionnaire asking about a number of aspects
17 of medical care. This included direct questioning about timings of
18 presentation, commencement of medical therapy, timing of senior review,
19 delays in investigations, utilization of intensive care and 'ICU Outreach'
20 teams, surgical interventions, medication errors, availability of equipment, and
21 management of cardiac arrest. The audit proformas were completed by senior
22 members of medical staff from the clinical team caring for each patient. The
23 audit period was from May 2010 to July 2011.

24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 **Results** 57 58 59 60

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5 During a 14 month study period, 979 audit proformas were received. 78.8%
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7 were completed by consultants, and 15.1% by registrars.
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11 The average patient age at the time of death was 81.8 years (range 0.75 –
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13 105 years). 46.6% were male, and 53.4% female. The most common causes
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15 of death were pneumonia / aspiration pneumonia accounting for 201 cases,
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17 sepsis accounting for 128, progression of cancer accounting for 151, and
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19 ischaemic heart disease accounting for 106. The patients were predominantly
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21 under the care of medical specialties, with 375 under care of the elderly, 174
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23 acute medicine, and 108 respiratory medicine. Deaths were evenly spaced
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25 over the course of the day, and were more prevalent in winter. There were no
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27 statistically significant variations in the distribution of deaths over the course
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29 of the week (see Table I).
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34 Insert table I
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37 54% of patients that died were, at the time of death, being cared for in
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39 accordance to the LCP. These deaths were therefore considered expected.
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41 The relatively high proportion of these patients reflects the presence in the
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43 trust of a large cancer centre with inpatient palliative care. The remaining 447
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45 were classed as unexpected and were investigated further.
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50 When asked their perception on the probability of survival with optimal
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52 management / the preventability of the death, of those that answered, 21%
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54 either responded as no idea, or did not respond at all. Of the 79% of
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56 responses, 93.3% felt the death was not preventable, 5% unlikely to be
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3 preventable, 0.9% likely to be preventable, and 0.6% almost certainly
4 preventable. Thus a total of only 1.4% of deaths were thought likely to be
5 preventable. This is significantly lower than a recently published estimate from
6 retrospective case note review [9] ($p < 0.0001$, Fisher's exact test).
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14 When asked about the standard of care and areas for improvement, in 77.3%
15 of cases, the auditor felt good practice had been followed. 13.3% of the time,
16 there were areas of clinical care with room to improve on, in 6.0% of cases
17 this applied to organisational care, and in 2.7% of cases, this applied to both.
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19 In only 0.7% of cases did the auditor feel that care was less than satisfactory.
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21 This compares with the NCEPOD study of 2195 deaths, in which 60.9% of
22 cases were adjudged to have received good clinical care, 34.2% had room for
23 improvement, and 4.9% was less than satisfactory. The differences in the
24 values for good clinical care and less than satisfactory care are also
25 significant ($p < 0.0001$, Fisher's exact test) (see Table II).
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36 Insert Table II

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38 Interestingly, when considering individual specified parameters, failings in
39 quality of care were more frequently identified. In 8.4% of cases, the auditor
40 identified avoidable delays in management, 3.3% of cardiac arrests were not
41 considered to be managed according to best practice, 0.5% identified a
42 medication error, 4.1% an avoidable complication, and 2.6% identified
43 unavailability of equipment or resources that contributed to a deterioration in
44 the patient's condition.
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55 Discussion

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This study highlights a major disparity between widely accepted levels of preventable death, as assessed by retrospective case note review applied by trained reviewers, and clinician's perspective of the preventability of death.

There are a number of possible reasons for this disparity:

1. An unusually low level of preventable death during the study period.
2. Clinicians felt unable to answer proformas truthfully.
3. A 'knowledge gap' where clinicians who have treated patients are more aware of details of care than external reviewers.
4. An 'objectivity gap' where clinicians who have treated patients are unable to perceive deficits in the quality of care.

Unusually low preventable mortality

The first possibility is that the trust has an unusually low level of preventable death. This seems highly unlikely. The HSMR of around 100 indicates that the trust sees the expected level of mortality (as adjusted by diagnosis and co-morbidity), not a lower level than the NHS average. Furthermore, with the exception of a large cancer centre, the trust has a relatively 'normal' mix of acute services. In addition, the causes of death correlate well with national figures. **The study included a sufficient number of cases to make random variation unlikely.** These factors all make it highly unlikely that the trust has an abnormally low level of preventable death.

Clinicians unable to answer proforma

It is also possible that clinicians felt unable to answer the audit pro forma honestly. It was made clear that the results were purely for the purposes of audit and quality improvement, and all identifiable data would only be handled by the audit team. The way in which the audit data were managed minimized this potential problem. Nevertheless, this issue should be considered as a potential confounding factor.

A 'knowledge gap'

Of the two more likely possibilities, the first is that the disparity is due to the 'knowledge gap' between someone reviewing a set of notes retrospectively, and a clinician looking after a patient. 'Retrospective case note review' is the most commonly used tool in assessing preventability of death. However, whilst they are specifically trained, independent and disinterested, reviewers will not be able to gain the insight and depth of knowledge about a case as a treating clinician. Case notes are not an entirely comprehensive record of all examination findings, clinical impressions and medical care. Medical records are rarely 'complete' – even in a conventional sense. A large NICE audit of 1000 patients found that more than half of clinical entries were not timed, and a third of clinical reviews were not recorded (NICE, 2015). But more importantly, even when records are complete in a conventional sense - they do not adequately encapsulate the impression a clinician forms when they review a patient. This impression might be a number of complex thoughts

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3 colored by conscious degrees of uncertainty, unconscious factors a clinician
4 might not be able to describe, and be heavily influenced by an individual's
5 experience. Furthermore, many clinicians may assess a patient, and the
6 subsequent interactions between clinicians may help to form opinions in a
7 complicated fashion, of which only a small proportion may be recorded
8 (Hamilton *et al.*, 2015). Whilst technology such as electronic records may
9 address some of these issues, it is likely that a 'knowledge gap' will persist in
10 the foreseeable future.
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23 This 'knowledge gap' has implications for the process of retrospective case
24 note review. It has already been noted (Lilford *et al.*, 2007), that there is
25 limited inter-observer reliability in independent retrospective review studies,
26 which further limits their utility – despite the fact that they are so commonly
27 used. McDonald *et al.* (2000) also argue that these studies lead to
28 overestimates of preventable mortality, as the structured questionnaire may
29 tend to emphasize deficits in care quality, and thus preventability is assumed,
30 when mortality may, in fact, be inevitable. Hayward *et al.* (2001) further points
31 out that deficits in care do not inevitably lead to mortality, but rather increase
32 the probability of mortality. In these cases, determining when a death is
33 'preventable', or simply 'deferrable' by a period of 1-2 months becomes
34 challenging. This raises the question of the objectivity of external reviewers.
35 When historians consider 'counterfactual' history, an accepted premise is
36 made that events will tend to revert to the situation that eventuated (Cowley,
37 2003). If we approached retrospective case note review with the same
38 premise, it is likely that we would find a much lower proportion of 'preventable'
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3 mortality. Equally, if a reviewer is asked to review cases from a notoriously
4 good or bad hospital, department or clinician – it might be that they
5 unconsciously judge care differently. Although Hayward *et al.* (2001) showed
6 these variations, they were unable to suggest a better tool to judge the
7 adequacy of an individual's care. They suggest that the identification of
8 patterns is crucial to improving quality.
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18 Because only patients that die are included in these studies, reviewers may
19 have a skewed perspective of the outcome or significance of minor errors.
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21 Even when all facts are known and debated at length, it is hard to know what
22 'proportion' of the mortality is caused by the error - notable legal cases
23 considering causality highlight this problem (Clark & Nolan, 2014). Further,
24 even when care is 'optimal', if the patient's prognosis is measured in weeks,
25 then the implication of 'preventable' mortality change.
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36 An 'objectivity gap'

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41 Lastly, it is possible that clinicians do not have an objective view of the
42 preventability of deaths of patients under their care. It may be that when a
43 patient dies, they are reluctant to accept that were it not for the actions of their
44 team and the nature of the hospital environment in which they work, the
45 patient may otherwise have survived. This could be termed an 'objectivity
46 gap'. The implicit recognition of an 'objectivity gap' seen in other approaches
47 to determining the preventability of mortality (Hogan *et al.*, 2012) gives weight
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5 Clearly, as aluded to above, independent retrospective case note review is
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7 not completely objective. Being advised to look through a set of notes looking
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9 for 'preventable' mortality may colour an individual's approach. Indeed, in
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11 Hogan's later paper on preventable mortality (Hogan *et al*, 2015), a reduction
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13 in 'preventable' mortality of 40% (from 5.2% to 3.0%) was predominantly
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15 ascribed to reviewer objectivity factors - such as awareness of 'do not
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17 resuscitate' orders, the wording of the questions in the proforma, and cultural
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19 changes to do with criticism of clinicians. Hogan *et al* acknowledge that
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21 meaningful measures on the proportion of preventable deaths might be made
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23 difficult by their rarity, and consequent low 'signal to noise' ratio of preventable
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25 death within all mortality. Despite these acknowledged weaknesses to this
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27 process, the UK still intends to use this tool to improve acute care quality
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32 (NHS England, 2016).

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36 This 'objectivity gap' nevertheless gives insights into how substandard care
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38 provided by institutions can be overlooked by clinicians working in those
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40 institutions. For example, a clinician, used to waiting for imaging, may view a
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42 delay of three hours for a scan as standard, and thus acceptable; whereas as
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44 independent reviewer may highlight this as an unacceptable cause of
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46 preventable death. This may partially explain high profile patient care
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48 scandals (UK Department of Health, 2013). It may also mean that clinicians
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50 working within a given setting, with its systemic constraints, are not best
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52 placed to monitor outcomes from that setting to which they are accustomed.
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3 **How should this inform practice?**
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7 This likely 'objectivity gap' has significant implications for quality assurance of
8 services that rely on individuals analyzing and assessing their own outcomes.
9 If an individual is unable to be objective about the quality of care they are
10 providing, then it is essential that institutions routinely utilize independent
11 assessors to conduct clinical governance. **There are clearly acknowledged**
12 **issues with independent case note review.** Enrollment in national audit
13 processes can also provide more objective measures of care quality, and
14 should be encouraged, **or even made mandatory.** Clearly such audit
15 **processes require adequate administrative support, but the potential quality**
16 **improvement makes this likely to be worthwhile.** Variations in outcome data
17 should then be thoroughly investigated.
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34 **This study does highlight the importance of the design of such investigations.**
35 **Retrospective investigations are limited by the availability of data, and the**
36 **quality of data available (as discussed above). Whilst it is likely that over time**
37 **the quality of clinical records will improve – as technological and cultural**
38 **changes improve recording mechanism – there will still be a 'knowledge gap'**
39 **between those caring for patients and external assessors. Prospective studies**
40 **may be affected by intrinsic bias associated with changes to practice induced**
41 **by the presence of an assessor. The use of patient reported measures has**
42 **been suggested by Varagunam *et al.* (2015), but is itself both subjective and**
43 **subject to bias. Outcomes such as mortality are probably most appropriate for**
44 **investigation – they are reliably recorded, and categorical.**
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5 Serious incident reviews and coroner's investigations involve both
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7 independent external assessors and those that treated the patients. This
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9 allows the synthesis of a more nuanced view of events. They could therefore
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11 play a role in quality assessment. For this to happen, however, they would
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13 have to occur more frequently, be welcomed by clinical teams, and be
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15 approached in an open and constructive manner. This may be challenging
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17 given that such investigations are time-consuming and expensive, although
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19 more limited external investigations could be conceived.
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25 Mortality variations on a departmental level are, perhaps, the most
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27 appropriate level to look at such data. Studying data for individual clinicians
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29 has been suggested to lead to risk-avoidant practices, may be more
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31 susceptible to random variation, and may have deleterious effects on the
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33 clinicians (Westaby *et al.*, 2007) (Holme & Aziz, 2010). Hospital wide mortality
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35 variation may obscure outcomes from poorly performing departments with
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37 data from well performing departments. Furthermore, variations in a hospital's
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39 case mix mean such data is prone to bias. For example, an institution with a
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41 large throughput of low risk day case surgery may well have a low mortality;
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43 and while some of these variations can be mitigated against, using statistical
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45 tools and analysis, such steps introduce their own bias. It has been
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47 questioned why hospital-wide mortality indices can vary by as much as 80%
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49 between hospitals, despite most studies suggesting that only about 5% of
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51 inpatient mortality is 'preventable' (Nash & Quinn, 2013). Furthermore, whilst
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53 hospital-wide measures certainly have an impact on patient care, the majority
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3 of clinical governance processes take place at a departmental level. Individual
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5 clinicians compare themselves and their outcomes to their colleagues. Whilst
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7 national audit programs can be useful in these cases, comparison between
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9 departments on a national level is perhaps a more straightforward approach.
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11 Furthermore, data such as mortality, as mentioned above, is already routinely
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13 collected – and in depth analysis has shown such datasets identify the vast
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15 majority of patient care (Westaby *et al*, 2007). Departmental variations in
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17 mortality have been shown (Nouraei *et al*, 2013), and the routine analysis of
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19 this data has been suggested as the most practical and objective way of
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21 monitoring outcomes (Nouraei *et al*, 2016).
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27 **Summary**

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32 Certainly it is possible, and even likely, that a combination of these factors
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34 may have caused our results. This is important because it indicates that part
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36 of the reduced level of ‘preventable’ mortality that we saw in our study may be
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38 a true representation of what is ‘preventable’. This has also been suggested
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40 by Hayward & Hofer (2001). It is for this reason that it has been suggested
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42 that as we seek to reduce mortality and explain the variations in mortality
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44 between different institutions, factors other than independently assessed
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46 ‘preventability’ should be considered (Nash & Quinn, 2013).
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51 **Conclusions**

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3 There is a wide disparity between independent case note review and
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5 clinicians assessing the care of their own patients. This may be due to a
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7 'knowledge gap' between reviewers and treating clinicians, an 'objectivity gap'
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9 meaning clinicians may not recognize preventability of death of patients under
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11 their care, or a combination of these factors.
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18 **Acknowledgements**

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28 **Competing Interests**

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30 We have no conflicts of interest to declare.
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38 **Funding**

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42 This audit was undertaken as part of the trust's ongoing clinical governance
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44 and audit program. No additional funding was required.
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| Day of Week | Number of Mortalities | Proportion (95% CI range) | P value (with mean) |
|-------------|-----------------------|---------------------------|---------------------|
| Monday | 132 | 13.5% (11.3 – 15.6%) | 0.65 |
| Tuesday | 143 | 14.6% (12.4 – 16.8%) | 0.90 |
| Wednesday | 154 | 15.7% (13.4 – 18.0%) | 0.41 |
| Thursday | 147 | 15.0% (12.8 – 17.3%) | 0.70 |
| Friday | 140 | 14.3% (12.1 – 16.5%) | 1.00 |
| Saturday | 124 | 12.7% (10.6 – 14.7%) | 0.32 |
| Sunday | 139 | 14.2% (12.0 – 16.4%) | 1.00 |

Table 1: Distribution of mortality by weekday

| Care Quality | Audit Response with proportion (95% CI range) | NCEPOD report with proportion (95% CI range) | P value (Fisher's exact test) |
|---------------------------|---|--|-------------------------------------|
| Good Practice | 320 of 414 77.3% (73.3 – 81.3%) | 1337 of 2195 60.9% (58.9 – 63.0%) | p<0.0001 |
| Areas of improvement | 91 of 414 22.0% (18.0 – 26.0%) | 751 of 2195 34.2% (32.2 – 36.2%) | p<0.0001 |
| Less than Satisfactory | 3 of 414 0.7% (0.0 – 1.5%) | 107 of 2195 4.9% (4.0 – 5.8%) | p<0.0001 |

Table 2: Clinicians' perception of quality of care