Auditing mortality from upper gastrointestinal haemorrhage: impact of a high dependency unit

ABSTRACT — Background: a retrospective audit conducted at our district general hospital indicated that mortality from upper gastrointestinal (GI) haemorrhage was above that reported from nearby centres.

Objectives: To assess the impact of establishing a high dependency unit (HDU) and agreed management protocol on subsequent mortality from upper GI haemorrhage at our hospital.

Design: Prospective audits were conducted before and after the establishment of an HDU. All acute admissions, as well as established inpatients with haematemesis and/or melaena, were examined for fitness for endoscopy, comorbidity, underlying diagnosis and the need for surgery.

Subjects: Over a two-year period, 524 patients were studied in the two audits. Risk scores were calculated and the 30-day mortality from all causes assessed.

Results: There was a trend towards higher age and co-morbidity during the second audit. Mortality was 9% and 10% during the first and second audits, respectively.

Conclusions: An increasing proportion of patients with bleeding are elderly and have associated comorbidity. Establishment of an HDU and agreed protocol did not reduce mortality at our centre.

A retrospective audit of patients admitted in 1980–81 to our hospital with upper gastrointestinal (GI) haemorrhage reported an overall mortality of 15%, with an operative mortality of 41%. The overall mortality figure was close to the 14% in the UK national audit, but several authors have since reported mortality rates below 5%. Some of these authors attribute their success to the establishment of dedicated units with specialised staffing, but others have argued that low mortality can be achieved by close adherence to an agreed management protocol and certain standards of practice.

We present the results of two audits in which every effort was made prospectively to include all patients presenting with upper GI haemorrhage. Mortality was related to patient risk scores. The impact of a high dependency unit (HDU) and agreed management protocol on mortality was also examined.

Method

Audit 1 lasted from October 1993 to June 1994, and Audit 2 from December 1994 to July 1995. A combined medical/surgical HDU with a nurse to patient ratio of 1:2 was established in December 1994 with facilities for close monitoring of seriously ill patients who do not require mechanical ventilation. A management protocol was agreed, including the instruction that all patients at high risk of rebleeding (as outlined in Table 1) should be admitted to this unit. On the HDU, patients remain under the care of their admitting consultant physician unless surgery is deemed necessary. The duty surgical registrar reviews any patients with bleeding on the HDU at least once daily. Adherence to the protocol, which includes a policy of transferring all patients with bleeding from non-acute hospitals in the vicinity to our hospital, is regularly monitored by means of audits conducted by the GI unit.

Ascertainment methods

All patients with a convincing history of a bleed and/or evidence of haematemesis or melaena were included, irrespective of age or comorbidity. Special care was taken to include patients who developed bleeding whilst already hospitalised for other reasons, as well as patients transferred from non-acute hospitals in the vicinity. The gastroenterology registrar, or nominated deputy, obtained the relevant data daily from the Accident and Emergency (A&E), admission room and endoscopy records, and by questioning the teams responsible for emergency care and covering the previous night. This information was recorded on a form, completed prospectively while the patient was followed from admission to discharge or death. All data were subsequently entered on to a database (Claris Works 2.0).

Significant bleeding/rebleeding

Patients were considered to have had a significant bleed if they had features of hypovolaemic shock (peripheral vasoconstriction with a systolic blood pressure below 100 mmHg and/or pulse rate above 100 per min), or if they had fresh haematemesis and/or repeated fresh melaena. Rebleeding was defined as the signs and symptoms of bleeding that occurred within 10 days of the initial presenting bleed.

Deaths

All deaths occurring within 30 days of the index bleed were included, and classified as being due to underlying disease,
Table 1. Protocol for the management of upper gastrointestinal (GI) haemorrhage at the Royal Gwent Hospital.

1. **Adequately resuscitate** patients with a colloid infusion, through a wide-bore cannula in shocked patients, until blood is available.

2. All patients with suspected upper GI haemorrhage should be transferred/admitted to the Royal Gwent Hospital. Patients with high-risk features or significant bleeding should be transferred urgently.

3. Manage all patients with high-risk features on HDU or ITU and inform the duty Surgical Registrar about all such patients:
   - Hypovolaemic shock on admission systolic (BP <100 mmHg and/or pulse >100/min);
   - Fresh haematemesis >200 ml and/or repeated melaena;
   - Overt bleeding in any patient >60 years of age or Hb <10 g% at presentation or known ulcer.

   The duty surgical registrar will visit the HDU at least once a day and inform the consultant on-call surgeon about all patients with high-risk features.

4. Appropriately monitor vital parameters and stool chart in all patients.

5. Aim for endoscopy within 24 hours. All high-risk patients should be endoscoped within 6–18 hours of presentation after appropriate resuscitation.

6. In patients with suspected variceal haemorrhage resuscitate with colloid and then give blood and FFP as per the prothrombin time. Give metoclopramide 20 mg as an iv bolus, followed by octreotide 50 μg bolus followed by an infusion at 50 μg/h. Use a Sengstaken tube in case of continuing fresh haematemesis, shock or massive haematemesis. Endoscopic sclerotherapy will be done after initial resuscitation when the patient is stable.

7. Consider emergency surgery for patients with a bleeding peptic ulcer if:
   - Age >60 years: continuing bleeding with a spurring vessel at endoscopy, rebleeding in hospital or transfusion requirement of >4 units to correct acute blood loss;
   - Age ≤60 years: continuing bleeding with a spurring vessel at endoscopy, rebleeding in hospital or transfusion requirement of >8 units.

### Risk scores

Once the data were available, partial and complete Rockall scores\(^a\) were assessed for both audits and compared with the scores from the national audit. Partial Rockall scores are based on age, comorbidity and haemodynamic status on admission or at onset of bleeding; complete Rockall scores take endoscopic findings into account as well.

### Results

A total of 298 patients was studied in the first audit and 226 patients in the second audit (Table 2). The median age of the patients was 65 years and 67 years, with 20% and 23% of patients aged 80 years or more, in the first and second audits, respectively. Endoscopy was performed in 226 patients (76%) in the first audit and 183 (81%) in the second. Ten patients in the first audit and four in the second could not be made fit for endoscopy; eight of them arrived in A&E or the admissions unit with severe hypotension or electromechanical dissociation due to massive bleeding, and the remainder had significant comorbidity, such as heart failure or recent myocardial infarction, which would have greatly increased the risk of the procedure. There were also 46 patients in the first audit and 29 patients in the second who were not endoscoped as they had minor bleeds. The most common endoscopic diagnosis was peptic ulcer (duodenal and gastric) disease in 69 patients (31%) in the first and 69 patients (38%) in the second audit (Table 3).

### Endoscopic injection therapy

Endoscopic methods to control bleeding or prevent rebleeding were used in 26 (9%) of the patients in the first audit and 30 (13%) in the second (Table 2). Combining the results of the two audits, 16 patients underwent injection of

| Table 2. Data from the two audits on upper gastrointestinal haemorrhage. |
|---------------------------------------------------------------|
| **Demographic data** | **Audit 1** | **Audit 2** |
|----------------------|------------|-------------|
| No. of patients      | 298        | 226         |
| Sex                  | 183M/115F  | 120M/106F   |
| Median age (years)   | 65         | 67          |
| Age ≥ 60 years       | 178        | 152         |
| Age > 80 years       | 58         | 52          |
| H/O NSAIDs           | 61         | 55          |
| Total endosed        | 226        | 183         |
| Therapeutic injection| 26         | 30          |
| Total undergoing surgery | 16      | 8           |
| 30-Day mortality (all cases) | 26 | 23 |

H/O = history of
NSAID = non-steroidal anti-inflammatory drug
bleeding oesophageal or gastric varices, three of whom rebled and died (one after emergency splenorenal shunt). Bleeding ulcers were injected with adrenaline or alcohol in 31 patients; 10 (32%) of them rebled and required further surgery, but six of those patients died.

Surgery

Sixteen of 298 patients (5%) in the first, and eight of 226 patients (3.5%) in the second audit required surgery to control bleeding (Table 2). Under-running of the ulcer was the most common operation. In the first audit, four patients (25%) died within 30 days after the operation. Five patients (62.5%) died post-operatively in the second audit, all of whom had serious additional illnesses (cirrhosis (2), ischaemic heart disease (2), carcinomatosis (1)).

30-day mortality

Causes of death are listed in Table 4. The 30-day mortality from all causes was 9% in the first audit and 10% in the second (Table 5). The difference was not significant ($\chi^2=0.32, p>0.5$). Overall mortality in those aged more than 80 years was higher in the first than in the second audit. An underlying malignancy was diagnosed in six patients who died during the first audit and in eight who died during the second audit. Advanced liver disease contributed to seven deaths in the first audit and three in the second audit. Eight patients in the first and three in the second audit died from uncontrolled bleeding.

Risk scores, transfusion requirements and length of stay

The proportion of high-risk patients was slightly greater in the national audit than in our audits (Figs 1 and 2). The median length of stay in hospital for patients in both audits was five days. For patients requiring transfusion, the median amount was four units in both audits.

![Table 3. Comparison of endoscopic findings in the two audits.](image)

| Endoscopic diagnosis            | Audit 1 (226 patients endoscoped) | Audit 2 (183 patients endoscoped) |
|--------------------------------|-----------------------------------|-----------------------------------|
| Duodenal ulcer                 | 41 (18.1)                         | 39 (21.3)                         |
| Gastric ulcer                  | 28 (12.3)                         | 30 (16.4)                         |
| Oesophageal ulcer              | 5 (2.2)                           | 6 (3.3)                           |
| Oesophagitis                   | 35 (15.4)                         | 29 (15.8)                         |
| Mallory Weiss tear             | 17 (7.5)                          | 8 (4.4)                           |
| Varices                        | 16 (7.1)                          | 12 (6.6)                          |
| Gastritis/gastric erosions     | 27 (11.9)                         | 22 (12.0)                         |
| Duodenitis                     | 13 (5.7)                          | 5 (2.7)                           |
| Upper gastrointestinal malignancy | 8 (3.5)                          | 10 (5.5)                          |
| Others (polyps, angiodysplasia)| 4 (1.8)                           | 1 (0.5)                           |
| Normal endoscopy               | 32 (14.1)                         | 21 (11.5)                         |

![Table 4. Causes of death.](image)

| Cause of death               | Audit 1 (26 deaths) | Audit 2 (23 deaths) |
|-----------------------------|---------------------|---------------------|
| Coincidental disease        | 6 (23.1)            | 11 (47.8)           |
| Underlying disease          | 8 (30.8)            | 4 (17.4)            |
| Bled to death               | 8 (30.8)            | 3 (13.0)            |
| Post-operative death        | 4 (15.3)            | 5 (21.8)            |

![Table 5. Overall all-cause 30-day mortality.](image)

| Overall mortality | Audit 1 (% of patients) | Audit 2 (% of patients) |
|-------------------|-------------------------|-------------------------|
| All ages          | 9                       | 10                      |
| ≥60 years         | 10                      | 13.8                    |
| ≥80 years         | 17.2                    | 11.5                    |

Discussion

Comparisons between published audits of upper GI haemorrhage are made difficult by variations in methodology. Many series do not specify the methods used for ascertainment, criteria for inclusion and exclusion, and details of causes of death. We have emphasised the need for uniform methodology in future audits of upper GI haemorrhage, and have made recommendations\(^\text{10}\) Standard criteria in keeping with these recommendations were used in both audits.

The national audit has recently presented figures for the current incidence and mortality from upper GI haemorrhage in the UK, and has emphasised the increasing number of elderly patients\(^\text{2}\). We, too, have observed a 3% rise in the percentage of patients aged 80 or more over a two-year period. This limits the scope for reducing overall mortality because many older patients have associated serious illnesses or develop exacerbations of pre-existing cardiac or respiratory disease while recovering from their bleed.

An increase in therapeutic endoscopy in the second audit coincided with the appointment of a second consultant gastroenterologist to the hospital. The more liberal use of endoscopic injection therapy may explain the low operation rate in the second audit compared with the first (3.5% vs 5%). The operative mortality was also higher in the second audit, perhaps because patients who fail to respond to injection are sicker and less likely to survive surgery. This suggestion is consistent with the experience of some authors who found that patients who rebled after injection therapy are at greater risk of post-operative death\(^\text{1,12}\).

On a critical analysis of our mortality figures we felt that four patients in the first and two in the second might have benefited from earlier surgery and perhaps have had a different outcome. However, two of these patients had
Child's C cirrhosis and a third had carcinoma of the stomach with metastases (found at post-mortem). There was a delay in transferring one patient to the HDU, which may have been a contributory factor to her death. Of the remainder, one had significant sepsis and should have been endoscoped and operated earlier, and the other had hypotension leading to a fatal myocardial infarction and could not be endoscoped.

In contrast to other published audits on upper GI haemorrhage\(^5\), the introduction of an HDU has not improved our mortality figures, nor has there been any reduction in transfusion requirements or length of stay in hospital. This may reflect a policy of including 'all comers' with bleeding (including the most elderly frail patients) and the comprehensive prospective ascertainment methods of our audits. The results suggest that the introduction of an HDU and management protocol does not have a major impact on deaths from upper GI haemorrhage - but to prove an absence of any benefit would require a study with very large numbers of patients.

The introduction of an HDU and an agreed management protocol may, however, bring about benefits other than mortality reductions. It has recently been suggested that an agreed management protocol and the more liberal use of
therapeutic endoscopy might reduce out-of-hours endoscopy and the need for emergency surgery.\(^{13}\)

In our hospital, patients with upper GI haemorrhage are managed by the in-taking physicians of the day according to a defined protocol. The on-call surgeons are asked to see all patients with high-risk features. We believe that our model parallels that of most district hospitals in the UK. In contrast, specialist centres in Bath\(^5\) and Aberdeen\(^6\) have recommended that all patients with bleeding be admitted to a designated unit and managed jointly by medical gastroenterologists and gastrointestinal surgeons. Specialist bleeding units are expensive to run and can be implemented only in large well-staffed hospitals. Furthermore, specialisation may deny some of those training in general (internal) medicine the opportunity of managing patients with GI haemorrhage. Nevertheless, these difficulties may need to be overcome if the result is a mortality of less than 4%\(^6\).\(^6\)

Does the widespread introduction of specialist bleeding units hold the key to reducing mortality from upper GI haemorrhage? Rockall and his colleagues suggested in the national audit paper\(^9\) that the scope for reducing mortality was limited because of the increasing number of frail elderly patients with coincidental or underlying illness. The low mortality in specialist centres was reported before the Rockall scoring system became available\(^9\). This system facilitates the comparison of case-mix and risk categorisation within audit series. It can now be readily appreciated, for example, that the marginally lower mortality in our series than in the national audit is probably a reflection of the slightly higher risk scores in the latter. Our mortality is higher than that reported from the specialist bleeding units in Bath and Aberdeen, but our audits contained more patients with variceal bleeding or older than 80 years. The specialist units ran an open-access admission policy, but selection bias may have contributed to their success because it is possible that referring doctors were reluctant to transfer their sickest and most frail elderly patients.

**Conclusion**

In conclusion, we have been unable to demonstrate that the introduction of an HDU and agreed management protocol carried out by the admitting physician’s team reduces mortality from upper GI haemorrhage. Further work is needed to define whether lower risk categorisation may have contributed to the encouraging results from the specialist centres reporting the lowest mortality figures, and the extent to which each component (specialist physicians and surgeons, close monitoring on high dependency, thera

tepic endoscopy, and an agreed management protocol) could contribute to mortality reductions in these patients.

**Acknowledgements**

We would like to acknowledge the help and support given to us by the consultant physicians and surgeons of the Royal Gwent Hospital, the nursing staff of the HDU and Calcraft Endoscopy Unit, Dr Belinda Stewart and Dr Javaid.

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Address for correspondence: Dr M C Allison, Department of Gastroenterology, Royal Gwent Hospital, Newport, South Wales, NP19 2UB.