

Upper gastrointestinal bleeding in an open-access dedicated unit

ABSTRACT—The open-access high dependency bleeding unit in Aberdeen admits all patients with suspected gastrointestinal bleeding from a stable adult population of 468,000. The aim is to reduce mortality, morbidity and hospital stay, and create a prospective whole community database. An agreed management protocol is based on prompt resuscitation and early diagnosis. From October 1991 to September 1993 there were 1,602 consecutive admissions with suspected upper or lower gastrointestinal haemorrhage. Bleeding was confirmed in 1,098 of 1,324 patients with presumed upper gastrointestinal haemorrhage, (117 bleeding episodes per 100,000 per year). The overall 30-day mortality was 3.9%, with all deaths attributable to significant concurrent illness. Mortality from peptic ulcer bleeding was 5.3%, with an operation rate of 17% and surgical mortality of 8%. Rapid diagnosis allowed 48% of 523 patients with trivial bleeds to be discharged after a median stay of 24 hours. Centralised expertise and equipment is the essence of the unit's success. The interests of patient care are better served, nursing skills are better developed and teaching opportunities better structured. The major improvement in clinical care, welcomed by hospital colleagues, management and general practitioners, makes the unit an indispensable part of acute medical provision.

The approach to management of upper gastrointestinal haemorrhage is variable. Patients are admitted to general medical and surgical wards, often with no agreed management protocol, leading to delays in resuscitation, diagnosis and surgical referral. This may explain why reported mortality rates from upper gastrointestinal haemorrhage have not fallen despite technical advances during the last 30 years [1–9], although the increasing age of those who bleed must also contribute [1,3,10]; within NE Scotland community mortality rates of 10–14% [2–4] were comparable to those elsewhere.

J MASSON, MRCP, Registrar in Gastroenterology
P N BRAMLEY, MRCP, Senior Registrar in Gastroenterology
K HERD, Research Nurse
G M MCKNIGHT, MRCP, Staff Grade
K PARK, FRCS, Consultant Surgeon
P W BRUNT, FRCP, Consultant Gastroenterologist
A W MCKINLAY, FRCP, Consultant Gastroenterologist
T S SINCLAIR, FRCP, Consultant Gastroenterologist
N A G MOWAT, FRCP, Consultant Gastroenterologist
Aberdeen Royal Infirmary

Although sporadic reports from specialised bleeding units have documented lower mortality rates from upper gastrointestinal haemorrhage [11–14], they remain few in number. Their reported successes prompted the opening, in October 1991, of the first open-access dedicated unit for all patients in NE Scotland with suspected gastrointestinal haemorrhage. The aims were to emulate the lower mortality rates reported by bleeding units elsewhere; to shorten hospital stay by improving patient triage; to establish a community database for gastrointestinal bleeding in NE Scotland and to assess the role of the unit in the management of lower gastrointestinal bleeding [15].

We report here the results of managing patients within a dedicated unit according to a defined protocol which can be compared to historic data from NE Scotland and against which to judge any future changes in management.

Subjects and methods

All patients with suspected upper or lower gastrointestinal bleeding from October 1991 to September 1993 were admitted to a six-bedded, high dependency bleeding unit in Aberdeen Royal Infirmary, the only such unit serving NE Scotland, Orkney and Shetland (adult population of 468,000—General Register Office for Scotland 1993). The majority of patients were admitted as direct general practitioner referrals (73%), but 11% came from Accident and Emergency departments, 7% were inter-hospital transfers and 9% were intra-hospital transfers. The unit is staffed at all times by two endoscopy-trained staff nurses and a resident senior house officer specifically allocated from the hospital junior staff rota.

On admission patients are categorised into severity groups:

'Significant': with one or more of the following: a history of collapse, shock, haemodynamic disturbance or fall in haemoglobin below 10 g/dl.

'Trivial': with no haemodynamic disturbance, melaena or fall in haemoglobin below 10 g/dl.

'No bleed': no evidence of blood loss.

All patients admitted between 9 am and 11 pm are endoscoped the same day. Those with 'significant bleeds' admitted during the night are endoscoped as soon as resuscitated. An experienced team of gastroenterologists and surgeons provides continuous endoscopy cover. The unit is led by a consultant

gastroenterologist in close collaboration with surgical colleagues.

Patients are transfused until haemodynamically stable, aiming for a post-transfusion haemoglobin of 10–11 g/dl.

All patients with significant bleeds are reviewed with surgical colleagues when endoscopic stigmata are seen (visible vessel, fresh clot or active arterial bleeding) or large amounts of blood make visualisation at endoscopy impossible. Transfusion requirements of four units or more (excluding replacement of chronic blood loss) or significant rebleed (defined as further haematemesis, melaena or drop in haemoglobin of 2 g/dl after being stable for 24 hours) are the principal agreed indications for surgery.

In this study period (1991–3), injection therapy was routine for variceal bleeds only and was otherwise reserved for a few patients who were clearly too infirm for surgery.

Patients with 'significant bleeds' are kept in the unit for 48 hours before transfer to a ward or home. Low risk patients are discharged directly home unless prevented by other medical or social problems.

All data were collected prospectively. All deaths, including those after discharge, are presented for consensus view at the gastrointestinal department audit meetings. Mortality rates are expressed as 30-day mortality per patient admission. All deaths are categorised either as

- Bleeding related deaths, which include all postoperative deaths or any death which could possibly be related to the index bleed, or as
- Non-bleeding related deaths, where no link can reasonably be established with the index bleed.

Statistics

When appropriate, data are expressed as median with an interquartile range in brackets. Odds ratio with 95% confidence intervals (CI) is used for categorical data.

Results

Patients

There were 1,602 admissions with suspected (upper or lower) gastrointestinal bleeding. Of 1,324 with presumed upper gastrointestinal bleeding, 226 (17%) had not bled, leaving 1,098 with confirmed upper gastrointestinal bleeding. The male to female ratio was 2.9:1 in those under 60 years, and 1.1:1 in those over 60 years. Table 1 lists patients' age by decade.

Sources of referral

Most (73%) were direct general practitioner referrals, but 11% came from the Accident and Emergency

Table 1. Age of patients by decade and severity of bleed (percentages in parentheses)

Age	Significant	Trivial	Totals
<40	55 (10)	165 (31.5)	220 (20)
40–49	74 (13)	81 (15.5)	155 (14)
50–59	67 (11.5)	49 (9)	116 (11)
60–69	126 (22)	74 (14)	200 (18)
70–79	125 (21.5)	78 (15)	203 (18.5)
80–89	104 (18)	62 (12)	166 (15)
>90	24 (4)	14 (3)	38 (3.5)
Total	575 (100)	523 (100)	1,098 (100)

department and 16% bled whilst in hospital with another primary pathology.

Severity of bleed (Table 1)

Of 575 patients with 'significant bleeds', 120 presented with cardiovascular collapse. There were more patients over 60 years in the 'significant' group (66%; 379/575) than in the 'trivial' group (44%; 228/523).

Triage

The median time from admission to endoscopy was 3 hours (2–4) for patients with 'significant bleeds' and 4 hours (2.5–10) in patients with 'trivial bleeds'. Forty-eight per cent (249/523) of patients with 'trivial bleeds' and 19% (109/575) of patients with 'significant bleeds' were discharged directly home.

Patients with 'significant bleeds' stayed longer in the bleeding unit (43 hours (24–66) vs 24 (6–40)) and in hospital (7 days (4–11) vs 2 (1–5)) than patients with 'trivial bleeds'.

Origin of bleeding

The cause of bleeding documented at endoscopy, surgery or post mortem is recorded in Table 2. The majority of the 'no bleed' category presented with vomiting (48%) secondary to myocardial infarction, renal failure, diabetic acidosis, sepsis, viral illness, pregnancy, overdose and alcohol abuse; 14% had an 'acute abdomen' with perforation or obstruction and 6% had epistaxis/haemoptysis.

Peptic ulcer

Of 435 patients with peptic ulcer (40% of total), 275 had duodenal ulcer, 151 had gastric ulcer and 9 stomal ulcer. Two-thirds (286, 66%) were over 60 years and 98 (23%) older than 80 years. The mortality for peptic ulcer bleeding was 5.3% (23/435). The relationship of

Table 2. Origin of bleed

Diagnosis	1991-93	
	n = 1,098	%
Duodenal ulcer	275	25.0
Oesophagitis/ulcer	180	16.4
Gastric ulcer	151	13.8
Mallory-Weiss	113	10.3
Gastric erosions	90	8.2
Varices	59	5.4
Gastric and oesophageal cancer	27	2.5
Duodenitis	21	1.9
Others	59	5.4
No cause found	67	6.1
No endoscopy	56	5.1

Table 3. The relationship of endoscopic stigmata of recent haemorrhage (SRH) in peptic ulcers to various outcome measures

	Stigmata n = 244	No stigmata n = 173	Odds ratio (±95% CI)
Rebleed	61 (25%)	5 (3%)	11 (4-29)
Surgery	65 (27%)	3 (2%)	21 (6-67)
Transfusion requirement median (units)	4	2	
Hospital stay median (days)	8	4	
Mortality	17 (7.0%)	1 (0.6%)	13 (2-98)

SRH = Active bleeding, ooze, non-bleeding visible vessel, or fresh clot
In 18 patients the presence of SRH was not known

stigmata of recent haemorrhage to rebleeding, surgery, blood transfusion and mortality is reported in Table 3.

Of the 75 (17%) patients requiring emergency surgery, five went directly to theatre without endoscopy and in three the ulcer had also perforated. Surgical mortality for peptic ulcer haemorrhage was 8% (6/75). Surgery was performed by a consultant in 51 cases (68%) and a senior registrar in 20 (27%). The most common procedure was local suture with vagotomy and pyloroplasty.

Variceal bleeds

Forty patients (5.4% of total) had a total of 62 admissions with variceal bleeding. The overall 30-day mortality rate was 11/40 (27.5%) (or 11/62 (18%) per patient admission).

Aspirin/non-steroidal anti-inflammatory drugs (NSAIDs) and coexisting disease

Forty-one per cent (235) of patients with 'significant' bleeds, 22% (113) of patients with 'trivial' bleeds and 19% (44) of the 'no bleed' group had taken aspirin or NSAIDs (or both) by mouth. At least one additional disease was present in 56% (617) of patients with confirmed upper gastrointestinal bleeds.

Mortality

The combined medical and surgical 30-day mortality for confirmed upper gastrointestinal bleeding was 3.9% (43/1,098). Table 4 records all bleeding related deaths. Table 5 shows details of patients who died but in whom it was felt, after review, that the index bleed (mostly 'trivial') had not contributed. Mortality (18%) in those who bled whilst in hospital was significantly

higher than in those directly referred by general practitioners (2.4%) (odds ratio ± 95% CI = 6.7 (2.9-15.8)).

Discussion

The bleeding unit has an 'open-access' policy and is available at all times for advice or direct referral. Admission delays are minimised, most patients arriving within an hour of notification, with a mean time to endoscopy of four hours. The unit admits all suspected bleeds, so obviating the need for referring doctors to make the sometimes difficult distinction between upper and lower gastrointestinal bleeding. Such a policy inevitably attracts patients wrongly believed to have gastrointestinal bleeding. For this unit this applies to 17% of referrals; 40% are not ill and are quickly discharged; the rest are ill for other reasons, and after initial diagnosis and treatment, they are transferred to the appropriate unit in the hospital. These 'inappropriate' referrals are more than offset by the fact that we are able to discharge nearly 50% of all patients with 'trivial' bleeds directly home within 24 hours. This system of centralised expertise and rapid triage concentrates clinical effort on those with major bleeds, allowing early cost-effective discharge of the remainder. The potential economic benefits of this policy are important and are currently under detailed evaluation.

Data on upper gastrointestinal bleeding are frequently distorted by population selection such as exclusion by diagnoses [2,14], ill-defined catchment populations and failure to include those who bleed when already in hospital with another primary diagnosis [5,16]. With the acute services for NE Scotland centred in one hospital, Aberdeen Royal Infirmary is well placed to generate unselected community-based data [3,17,18]. The Aberdeen unit was the only acute

Table 4. All possible 'bleeding' related deaths

Age	Sex	Origin of bleed	Associated diseases	NSAID	Surgery
99	F	DU	Frail; multiple pathology	No	No
95	F	DU	Cardiac failure; multiple pathology	No	No
89	F	DU	Recent cerebrovascular event	No	No
87	F	DU	Recent myocardial infarct	No	No
86	M	DU	Renal impairment	Yes	Yes
86	M	DU	Perforation with bleeding	Yes	No
84	F	DU	Dementia, multiple pathology	No	No
79	M	DU	Cardiogenic shock, recent myocardial infarct	No	No
73	F	DU	IHD, post operative stroke	Yes	Yes
68	M	DU	CLL, prostatic cancer, ALD	Yes	Yes
68	M	DU	PCP, cardiac failure	Yes	No
66	M	DU	Lung cancer with hepatic secondaries	Yes	No
64	F	DU	Disseminated breast cancer	Yes	No
64	F	DU	Disseminated breast cancer	Yes	No
97	F	Gastric cancer	Cerebrovascular disease	No	No
91	F	Gastric cancer	Disseminated bowel cancer	No	No
56	F	Gastric erosions	ALD, aspiration pneumonia	No	No
64	M	Gastrojeuno-colic fistula	Septicaemia	Yes	No
90	F	GU	Bleeding and perforated ulcer, cardiac failure	Yes	Yes
87	F	GU	Fractured rib, pneumonia, heparin	Yes	No
81	F	GU	Bronchopneumonia, diabetes	No	No
78	M	GU	Respiratory failure, sepsis	Yes	No
77	F	GU	Pneumonia	No	No
77	M	GU	Airways disease, IHD	Yes	No
71	M	GU	Cardiac failure, airways disease	No	No
78	F	GU (and DU)	Pneumonia, hypertension, diabetes	Yes	Yes
72	M	GU (and DU)	Cerebrovascular disease	Yes	Yes
83	M	Mallory-Weiss	Second bleeding lesion not found, myeloma	No	Yes
72	F	Mallory-Weiss	Terminal event, cancer colon and stomach	No	No
61	M	Mallory-Weiss	ALD, hepatorenal failure, IHD	Yes	No
54	M	Small bowel	ALD, hepatic failure, varices	Yes	Yes
70	F	Unknown	Immunosuppressed on chemotherapy	No	No
69	M	Variceal	ALD, cirrhosis	No	No
67	M	Variceal	ALD, cirrhosis, diabetes (transection)	No	Yes
66	M	Variceal	Cryptogenic cirrhosis, airways disease	No	No
65	M	Variceal	ALD, hepatorenal failure	No	No
64	M	Variceal	ALD, hepatic failure, obesity	No	No
49	M	Variceal	ALD, hepatic failure, aspiration pneumonia	No	No
48	F	Variceal	ALD, hepatorenal failure	No	No
46	F	Variceal	ALD, hepatic failure	No	No
44	F	Variceal	ALD, hepatorenal failure	No	No
38	M	Variceal	ALD, hepatic failure, aspiration pneumonia	No	No
37	M	Variceal	ALD, hepatic failure, aspiration (TIPSS)	No	Yes

ALD, alcoholic liver disease; CLL, chronic lymphatic leukaemia; PCP, *Pneumocystis carinii* pneumonia; IHD, ischaemic heart disease; NSAID, prior use of aspirin or non-steroidal anti-inflammatory drugs; DU, duodenal ulcer; GU, gastric ulcer; TIPSS, transjugular intrahepatic portosystemic shunts

gastrointestinal endoscopy unit serving the whole of NE Scotland during the study period and thus gave a unique opportunity to establish a community database of gastrointestinal bleeding free from most distortions of case selection.

The reported incidence of gastrointestinal bleeding (117 confirmed bleeding episodes a year per 100,000 of the adult population) is much the same as that reported by Johnston *et al* [3] for the same region 25 years ago (116/100,000 adult population) and to the

Table 5. 'Non-bleeding' related deaths and median time to death

Place of death	Cause of death
After discharge (<i>n</i> = 8) Median 15 days	Metastatic cancer (4), perforated ileum, ventricular rupture, bronchopneumonia, pulmonary embolus
In hospital (<i>n</i> = 8) Median 5 days	Ruptured ventricular septum, extension of a stroke, respiratory failure with Eaton-Lambert syndrome, sepsis and intestinal obstruction, pulmonary embolus with PRV, myocardial infarct and renal failure, intracerebral bleed, disseminated TB and renal failure

PRV Polycythaemia rubra vera

recent national audit in England (103/100,000 adult population) [1]. The highest reported incidence to date is from the West of Scotland (145/100,000 adult population) [19]. Whilst lower incidences have been reported we cannot compare this incidence with data from elsewhere [5,8,20] because they have been based on total population rather than adult population (> 14 years, the population at risk) and/or patients bleeding whilst already in hospital were excluded. An audit during the first six months of operation confirmed that more than 95% of all bleeding patients in NE Scotland were admitted to the unit.

Previously reported community data from NE Scotland [2-4,21] allow a unique 50-year historical comparison. Since the 1940s there has been a three-fold increase in the proportion of bleeding patients over 70 years (11.7% increasing to 37%). In 1967-8 only 8.4% of admissions were over 80 years, compared with 19% in 1991-93. The observed fall in mortality in NE Scotland from 14% to 3.9% has occurred despite these demographic changes.

Severe concurrent disease in an elderly population was the principal cause of death and it is difficult to see how further reductions in mortality can be made. The overall bleeding related mortality was only 3.9%, comparable to the few reports from other bleeding units (2.8% to 7%) [11-14] and comparing favourably with the recently reported Royal College National Audit in England [1] (14%) and other reports of traditional management [5-9] (10-15%). In order to establish a standardised approach to reporting mortality in our unit, we have recorded all deaths at 30 days, including those discharged from hospital. We feel that this mortality statement is more informative than crude hospital mortality and is comparable to standard recording of surgical mortality. After careful review, all deaths were further categorised into: *bleeding related* and *non-bleeding related death*, as some of those dying had only 'trivial bleeds' and died so long after the index bleed that it could not have been contributory.

If all these patients are included in the analysis of a *hospital* mortality rate, the rate is still low at 4.6%.

Many factors may influence the overall mortality for gastrointestinal bleeding, including case mix which can vary from study to study. For example, in this report the proportion of patients over 80 years is lower than reported by Rockall *et al* [1] (27%) but is similar to that of Katschinski *et al* [8] and is greater than the West of Scotland audit [19] (14%). Mortality rates did rise with increasing age but plateaued after the age of 70. A more significant contribution to mortality was made by those in their fifth and sixth decade dying from variceal bleeding and liver failure. Similar to the findings of Rockall *et al* [1], 56% of our patients had concomitant disease and this also increased with age. Patients who bled whilst in hospital carried a significantly higher risk of dying than those referred directly from outwith the hospital, and although these two groups are not matched for age, their high mortality underlines the importance of including them in mortality data.

Most studies use diagnostic groups as a marker of severity of bleeding, but in an attempt to define severity more clearly and as a guide for the management protocol we have used a simple clinical classification. For accurate comparisons between studies it is necessary to have a nationally agreed scoring system which will take into account factors such as severity of bleed, demographic details and coexisting illness.

In some studies the proportion of patients in whom the cause of bleeding was not found, or the proportion of patients not investigated, is much higher (eg Rockall *et al* [1] reported no source of bleeding in 25% of patients, and in the West of Scotland [19] 30.8% were not endoscoped as inpatients). With early endoscopy we were able to determine the origin of bleeding in 94% of 1,042 patients. Early endoscopy not only allows prompt decisions on management or discharge, but will often increase the diagnostic yield as well as accuracy. This may explain why we found a relatively high proportion of patients (10%) who had bled from a Mallory-Weiss tear (MWT). In this study 35% of patients with MWT had a second, coincidental non-bleeding lesion; delaying endoscopy in these patients would have reduced the perceived incidence of the rapidly healing MWT and might have resulted in bleeding being wrongly attributed to the coincidental lesion.

The rate of surgical intervention is lower than in some units advocating early surgery [12,22] but is higher than in some units using endoscopic therapy [23-24]. The reported low surgical mortality not only reflects good resuscitation of patients prior to surgery and the experience and seniority of the surgeons performing the procedure, but may also have been positively influenced by the policy of early surgical referral.

Therapeutic endoscopic intervention has been reported to reduce rebleeding rates, surgical referral

and mortality [23–26]. Whether this confers additional benefit to patients managed in a dedicated unit is unclear, but having established a database of over 1,500 patient admissions managed according to a standard protocol, we are now close to finishing a randomised controlled trial of the use of endoscopic therapeutic intervention.

Some argue the case for clinical guidelines rather than a unit with management protocol. Our unit management protocol evolved after a review of recent literature and much discussion between consultant surgeons and gastroenterologists. In the context of a bleeding unit, the locally produced management protocol is more than a voluntary guideline; it is prescriptive and gives clear, written clinical management instructions for all to follow. The reduction in mortality, sustained over three years, is ample evidence that this approach is successful. It is of interest that our protocol has many similarities with the guidelines on upper gastrointestinal bleeding published by the Royal College of Physicians [27]. There is a single report of short-term success of guidelines in the management of upper gastrointestinal bleeding [16] and following approved guidelines in other clinical settings but this has been short term, and not universal [28]. A further audit of gastrointestinal bleeding failed to show any improvement in outcome measures after the introduction of guidelines [29]. Guidelines alone may therefore not be effective in the long term. Centralised expertise and equipment is the essence of success. Not only are the interests of patient care better served, but nursing skills are better developed and teaching opportunities better structured. Costs are not prohibitive. The Aberdeen unit serves an adult population of 470,000. The average district general hospital serves a population of 250,000–350,000, suggesting that a unit with three to four beds would be adequate to care for the expected numbers of gastrointestinal bleeds; one bed per 80,000 adult population is the minimum requirement.

We believe this management policy, with more efficient bed usage, good surgical results and reduced mortality is possible in any large hospital. If data in NE Scotland are reproducible elsewhere and we can assume a fall in mortality from 10% to 5% in an adult at-risk population of 47.5 million in the UK, 2,500 lives could be saved annually.

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Address for correspondence: Dr N A G Mowat, The Gastrointestinal Unit, Aberdeen Royal Infirmary, Foresterhill, Aberdeen AB9 2ZB.

Limitations of Expert Evidence

Edited by Stephen Leadbeater

Doctors, when asked to give expert evidence, may find the strength of their contribution diminished by their lack of experience of court procedures; while lawyers may become frustrated in the conduct of the case through failing to appreciate the ethical and practical constraints that limit a doctor's freedom to divulge information about a person's medical condition. At the conference, organised jointly by the Royal Colleges of Physicians and Pathologists, doctors and lawyers were able to listen to each other's problems and proffer clear practical advice. This book, based on the conference, will provide a helpful source of information to medical practitioners from a wide range of disciplines and to those in the professions supplementary to medicine as well as to members of the legal profession. Anyone involved in medico-legal matters, particularly those who give and receive expert evidence would do well to consult this book.

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