Original research

Increasing the low-risk threshold for patients with upper gastrointestinal bleeding during the COVID-19 pandemic: a prospective, multicentre feasibility study

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ABSTRACT

Objective During the COVID-19 pandemic, we extended the low-risk threshold for patients not requiring inpatient endoscopy for upper gastrointestinal bleeding (UGIB) from Glasgow Blatchford Score (GBS) 0–1 to GBS 0–3. We studied the safety and efficacy of this change.

Methods Between 1 April 2020 and 30 June 2020 we prospectively collected data on consecutive unselected patients with UGIB at five large Scottish hospitals. Primary outcomes were length of stay, 30-day mortality and rebleeding. We compared the results with prospective prepandemic descriptive data.

Results 397 patients were included, and 284 index endoscopies were performed. 26.4% of patients had endoscopic intervention at index endoscopy. 30-day all-cause mortality was 13.1% (53/397), and 33.3% (23/69) for pre-existing inpatients. Bleeding-related mortality was 5% (20/397). 30-day rebleeding rate was 6.3% (25/397). 84 patients had GBS 0–3, of whom 19 underwent inpatient endoscopy, 0 had rebleeding and 2 died. Compared with prepandemic data in three centres, there was a fall in mean number of UGIB presentations per week (19 vs 27.8; p=0.004), higher mean GBS (8.3 vs 6.5; p<0.001) with fewer GBS 0–3 presentations (21.5% vs 33.3%; p=0.003) and higher all-cause mortality (12.2% vs 6.8%; p=0.02). Predictors of mortality were cirrhosis, pre-existing inpatient status, age >70 and confirmed COVID-19. 14 patients were COVID-19 positive, 5 died but none from UGIB.

Conclusion During the pandemic when services were under severe pressure, extending the low-risk threshold for UGIB inpatient endoscopy to GBS 0–3 appears safe. The higher mortality of patients with UGIB during the pandemic is likely due to presentation of a fewer low-risk patients.

Significance of this study

What is already known on this topic

⇒ In light of the COVID-19 pandemic, international specialty groups recommended scaling down endoscopy to true emergencies only.

What this study adds

⇒ Extending the 'low-risk' threshold for non-requirement of inpatient endoscopy after upper gastrointestinal bleeding (UGIB) from Glasgow Blatchford Score (GBS) 0–1 to GBS 0–3 appears relatively safe. Fewer low-risk patients present to hospital during the pandemic.

How might it impact on clinical practice in the foreseeable future

⇒ Our easily reproducible extended low-risk threshold may prevent the need for an additional 11.1% of inpatient endoscopies for UGIB overall, easing the pressures on endoscopy services during peak periods of the pandemic.

INTRODUCTION

At the onset of the COVID-19 pandemic in 2020, together with the aerosol-generating nature of endoscopy and related issues of patient and staff safety, the British Society of Gastroenterology and other international specialty groups recommended scaling down endoscopy

to true emergencies only.[1 2] In addition, the redeployment of some endoscopy staff to COVID-focused acute services underlined the need to rationalise endoscopy provision.

Patients with suspected upper gastrointestinal bleeding (UGIB) and a Glasgow Blatchford Score (GBS) of 0–1 are recognised to be 'low-risk' for mortality or rebleeding and can be discharged, with outpatient endoscopy arranged.[3–5] Data from a UK study on UGIB showed that patients with GBS 2–3 have endotherapy or surgical intervention rates of 4.2%–4.4% and 96% survival; however, with a GBS >3, the need for endotherapy rises to 9.4% and survival falls below 90%.[6] Expanding the 'low-risk' definition for patients requiring inpatient endoscopy from GBS 0–1 to GBS 0–3 seems appropriate during peak periods of the pandemic when services are under significant strain.[7] In the UK, this could represent approximately 30% of patients presenting with UGIB.[8]

We designed a multicentre, prospective feasibility study to assess the safety and efficacy of introducing an extended 'low-risk' threshold for non-requirement of inpatient endoscopy after suspected UGIB during the initial peak period of the COVID-19 pandemic.

MATERIALS AND METHODS

Study design

This was a multicentre, prospective feasibility study which took place over a 3-month period; 1 April 2020 to 30 June 2020. Data were collected on consecutive, unselected patients presenting with suspected UGIB at five large Scottish hospitals: Aberdeen Royal Infirmary, Glasgow Royal Infirmary (GRI), Ninewells Hospital Dundee (NW), Queen Elizabeth University Hospital Glasgow (QEUH) and Royal Infirmary of Edinburgh.

Study procedures

Patients presenting with GBS 0–1 were managed as per the previously accepted low-risk pathway described in pre-existing guidelines, that is, discharged (unless admission required for other reasons), and to return for outpatient endoscopy when service provision allows. Patients with GBS 2–3 were included in the updated low-risk pathway and discharged to outpatient endoscopy following discussion with the gastroenterologist on call and were to be placed on a high-priority waiting list at each centre. A timeframe for outpatient endoscopy was not specified due to resource uncertainty at the onset of the pandemic. Exceptions were dependent on clinical assessment and judgement, for example, haemodynamic instability (systolic blood pressure <90 mm Hg), known or suspected cirrhosis, or antithrombotic use. For patients discharged without inpatient endoscopy, the policy in all centres was to prescribe high-dose oral proton pump inhibitors (PPIs) for suspected ulcer bleeding until outpatient endoscopy was performed. Patients were otherwise managed as per UK guidelines for UGIB.[9]

Data collection and predefined outcomes

All patients with suspected UGIB at the participating hospitals were included in the data collection. Data collected included patient characteristics, referral source, presenting GBS and the associated parameters, COVID-19 status, occurrence and timing of endoscopy as well as the relevant endoscopic findings and therapy. Patients were followed up for 30 days, or until death. At each hospital the data were collected by a lead gastroenterology trainee, and anonymised. Collation of the overall study data occurred at GRI, the lead site.

The predefined clinically relevant patient outcomes observed were as follows: Primary: mortality at 30 days, rebleeding at 30 days and length of hospital admission. Secondary outcomes were: need for blood transfusion, administration of endoscopic therapy and requirement for interventional radiology (IR) or surgery. Data and outcomes from GRI, QEUH and NW were compared with prepandemic, prospective, robust UGIB data, available from the same three centres, recorded during a 12-week UGIB study undertaken in Autumn 2018.

Study observations and statistical analysis

Data were assessed using a complete case analysis. For comparison with the prepandemic cohort, Pearson's χ^2 test and Fisher's exact test were used to compare proportions and the Mann-Whitney U test was used to compare means. A two-tailed significance level of 5% was used in all comparisons. Multiple logistic regression analysis was undertaken to determine independent predictors of survival in the present study cohort using predetermined patient characteristics, comorbidities, endoscopic factors, rebleeding and COVID-19 infection as variables. Statistical calculations were performed using Prism V.9 (GraphPad).

RESULTS

Three hundred and ninety-seven patients were referred with suspected UGIB during the study period, with the number per centre, patient characteristics and outcomes shown in table 1. Two hundred and eighty-four (71.5%) patients received an inpatient endoscopy, 245 (86.2%) of which were performed within 24 hours of presentation. The mean number of referrals per week was 29 (SD=5.1).

Endoscopic diagnosis and relevant interventions

Summaries of endoscopic diagnosis and endotherapy rates are included in table 1. Sixty-two per cent (66/106) of peptic ulcers required endotherapy and all but one of these patients received subsequent high-dose PPI. Eighty-four per cent (21/25) of patients who had oesophageal varices were treated with endoscopic band ligation. Twelve of 288 (4.2%) index endoscopies required subsequent IR or surgery due to refractory or recurrent bleeding, the reasons for which are available in online supplemental data 1.

Table 1 Patient characteristics, endoscopic findings and outcomes

Variable	Total n	Low risk (GBS 0–3)	High risk (GBS >3)
Total	397	84	313
Per centre			
ARI	89	20	69
GRI	73	18	55
NW	87	21	66
QEUH	84	17	67
RIE	61	8	53
Mean age (SD)	63.9 (17.8)	51 (17.94)	67 (16.2)
Male sex (%)	236 (59.4)	33	203
Mean GBS (SD)	8.3 (4.8)	–	–
Cirrhosis (%)	59 (14.8)	6 (7.1)	53 (17)
Antithrombotic medication use (%)	158 (39.8)	22 (26.2)	136 (43.5)
Pre-existing inpatients (%)	69 (17.3)	12 (14.3)	57 (18.20
Inpatient index endoscopies performed (%)	284 (71.5)	19 (22.6)	265 (85.7)
Inpatient index endoscopy diagnosis			
► Oesophageal varices	25	0	25
► Gastric varices	4	1	3
► Oesophageal ulcer	14	0	14
► Duodenal ulcer	59	0	59
► Gastric ulcer	33	1	32
► GAVE/PHG	13	0	13
► Mallory-Weiss tear	8	0	8
► Tumour	9	0	9
► AVMs/Dieulafoy	7	1	6
► Oesophagitis/gastritis/duodenitis	61	5	56
► Other	24	0	24
► Normal	31	21	10
Inpatient index endoscopy endotherapy (%)	105 (26.4)	2 (2.4)	104 (33.2)
Outpatient endoscopies performed	10	10	0
Outpatient endoscopy diagnosis			
► Oesophagitis	3	3	–
► Normal	7	7	–
Rebleed (%)	25 (6.3)	0 (0)	25 (8)
Mortality			
► All cause (%)	53 (13.3)	2 (2.4)	48 (15.3)
► GI bleeding (%)	20 (5)	1 (1.2)	19 (6.1)
Suspected COVID-19 at time of referral (%)	82 (20.6)	10 (11.9)	72 (23)
Proven COVID-19 at time of referral	14 (3.5)	2 (2.4)	12 (3.8)

ARI, Aberdeen Royal Infirmary; AVM, arteriovenous malformations; GAVE, gastric antral vascular ectasia; GBS, Glasgow Blatchford Score; GI, gastrointestinal; GRI, Glasgow Royal Infirmary; NW, Ninewells Hospital Dundee; PHG, portal hypertensive gastropathy; QEUH, Queen Elizabeth University Hospital Glasgow; RIE, Royal Infirmary of Edinburgh.

Mortality, rebleeding and length of stay

Comparisons between low and high-risk groups are shown in table 1. For all patients, 30-day all-cause mortality rate was 13.1% (53/397); for pre-existing inpatients who developed UGIB, the all-cause mortality rate was 33.3% (23/69). Mortality rates were consistent between centres (online supplemental data 2). The 30-day rebleeding rate was 6.3% (25/397) for all patients and 8.7% (9/69) for pre-existing inpatients. For all patients receiving inpatient endoscopy, median length of stay following the procedure was 5 days (IQR 3–8) and median unit of blood transfused was 1 (IQR 0–3, 173 patients).

Low-risk patient group

Of the 84 (21.2%) patients with GBS 0–3, 41 had a GBS of 0–1 and 43 had a GBS of 2–3. Nineteen (22.6%) of these patients underwent inpatient endoscopy due to clinical concern, the reasons for which are outlined in online supplemental data 3. Two (2.4%) patients (both GBS=3) received endotherapy—one had oozing oesophagitis treated with epinephrine spray and the other had gastric varices requiring thrombin injection. Ten outpatient endoscopies were performed by the time of data collection closure (ie, 30 days of follow-up). Of these 10 outpatients, endoscopy was normal in 7, and 3 had grade A-B oesophagitis, with 0 requiring endoscopic therapy. None of the 65 patients who were discharged without inpatient endoscopy were readmitted or died during follow-up.

The overall 30-day all-cause mortality rate in the GBS 0–3 group was 2.4% (2/84). One death was in a pre-existing inpatient (GBS=1) who was deemed unfit for endoscopy due to intercurrent illness (aspiration pneumonia, aged 80) and later died of sepsis. The other death was in a patient with cirrhosis (GBS=3) who presented with one coffee ground vomit. The patient was admitted following clinician concern due to underlying cirrhosis and shortly afterwards had a major haemorrhage. Urgent endoscopy revealed gastric varices requiring endotherapy with thrombin, but the patient subsequently died.

There were no differences in outcomes between patients with GBS 0–1 and GBS 2–3 (table 2). Overall, 10.3% of patients had GBS 0–1 and 21.2% had GBS 0–3.

High-risk patients (GBS >3)

Three hundred and thirteen patients had a GBS >3. The mortality rate in this group was 15.3% (48/313) and the rebleeding rate was 7.7% (24/313). Forty-eight (15.3%) of the 313 patients did not receive an endoscopy, 20 (41.6%) of whom died within the 30-day follow-up period. All were considered too unwell to undergo endoscopy. Causes of death in high-risk patients not undergoing endoscopy, as well as reasons for all high-risk patients not undergoing endoscopy, are available in online supplemental data 4.

Table 2 Comparison of outcomes between patients with GBS 0–1 and GBS 2–3 groups

Variable	GBS 0–1	GBS 2–3
n	41	43
Inpatient endoscopy	7	12
Endotherapy used	0	2
Mean units of blood transfused (SD)	0.05 (0.32)	0.18 (0.87)
Mean length of stay in days (SD)	3.25 (5.66)	4.25 (7.67)
Rebleeding	0	0
Mortality	1	1

GBS, Glasgow Blatchford Score.

Patients with COVID-19

Eighty-two patients were deemed to have clinically suspected COVID-19 illness at presentation; however, only 14 of these had a positive PCR test for the SARS-CoV-2 virus recorded. The mortality rate in this group was 20.7% (17/82). Of those who tested positive, five (35.7%) died. Endoscopy was undertaken in five (35.7%) of the patients positive with SARS-CoV-2, none of whom required endotherapy or experienced rebleeding, and all survived beyond 30 days.

Comparison with prepandemic data

When comparing individual results from three centres in the current study with robust consecutive prepandemic data available from the same three centres, there were significantly fewer patients referred with UGIB per week, but a significantly higher mean GBS, and 30-day mortality was observed during the pandemic (table 3). The proportion of patients with GBS 0–3 fell from 33.3% before pandemic to 21.2% during the COVID era (p=0.003). The proportion of patients with GBS 0–1 fell from 13.8% before pandemic to 10.2% during the COVID era (p=0.28).

Multiple logistical regression analysis for mortality

The presence of cirrhosis, being a pre-existing inpatient, age >70 and confirmed SARS-CoV-2 virus were all individual predictors of all-cause mortality (table 4).

DISCUSSION

This multicentre, prospective, feasibility study suggests that extending the threshold for patients with 'low-risk' UGIB from GBS 0–1 to GBS 0–3, during peak times of the COVID-19 pandemic, appears to be a relatively safe and pragmatic approach to relieve pressures on endoscopy services. Our data show that the higher mortality of patients with UGIB during the pandemic is associated with a lower proportion of low-risk patients presenting with UGIB. Mortality was predicted by age >70 years, UGIB in pre-existing inpatients, cirrhosis and proven COVID-19 infection.

Eighty-four (21.2%) patients were deemed 'low-risk' on the new extended threshold pathway (GBS 0–3). Two (2.4%) of these patients died during the 30-day follow-up, one due to sepsis and one bleeding related. Nineteen underwent inpatient endoscopy, two of whom required endotherapy, one of which was arguably unnecessary. No low-risk patients experienced rebleeding. However, it is imperative to ensure that clinical judgement is also used when felt appropriate. This could include patients presenting with UGIB and GBS 0–3, but who have haemodynamic instability, underlying cirrhosis or those taking antithrombotic medication. This was emphasised by the patient who had a calculated GBS=3 at presentation but was admitted in view of known cirrhosis. This patient had a significant bleed very soon after admission requiring endotherapy for gastric variceal

Table 3 UGIB data during COVID-19 pandemic compared with prepandemic UGIB data at three centres

Site	n		n/week			Mean GBS			30-day mortality			30-day UGIB mortality		
	Pre-COVID (12 weeks)	COVID era (13 weeks)	Pre-COVID	COVID era	P value	Pre-COVID	COVID era	P value	Pre-COVID (%)	COVID era (%)	P value	Pre-COVID (%)	COVID era (%)	P value
GRI	113	74	9.4	5.7	–	5.6	7.9	–	4 (3.5)	9 (12.2)	–	2 (1.8)	4 (5.4)	–
NW	108	87	9	6.7	–	7.1	8.2	–	9 (8.3)	12 (13.7)	–	3 (2.7)	5 (5.7)	–
QEUH	113	84	9.4	6.4		6.8	8.7		10 (8.8)	9 (10.7)	–	2 (1.8)	2 (2.4)	–
All	334	245	26.4 (SD 6.54)	18.9 (SD 5.31)	0.004	6.5 (SD 4.75)	8.3 (SD 4.64)	0.001	23 (6.8)	30 (12.2)	0.02	7 (2.1)	11 (4.5)	0.14

GBS, Glasgow Blatchford Score; GRI, Glasgow Royal Infirmary; NW, Ninewells Hospital Dundee; QEUH, Queen Elizabeth University Hospital Glasgow; UGIB, upper gastrointestinal bleeding.

Table 4 Multiple regression analysis for 30-day all-cause mortality

Variable	OR	95% CI	P value
Rebleeding	2.487	0.832 to 6.791	0.09
Cardiac failure	1.656	0.713 to 3.654	0.23
Cirrhosis	2.74	1.213 to 6.058	0.01
OOH endoscopy	1.696	0.5135 to 4.972	0.355
Endotherapy used	1.109	0.548 to 2.159	0.7661
Pre-existing inpatient	5.36	2.835 to 10.10	<0.0001
Age >70	2.189	1.176 to 4.168	0.015
Male sex	2.118	1.09 to 4.79	0.051
COVID suspected	1.143	0.457 to 3.047	0.775
COVID confirmed	10.16	3.063 to 36.83	0.0002

OOH, out of hours.

bleeding, but subsequently died. We believe that clinical judgement is an important aspect of any extended low-risk strategy. A clinician's 'gut feeling' has been shown to be an independent predictor of intervention, rebleeding and mortality in patients with UGIB, and is most effective when combined with prediction scores such as the GBS.[10]

Clinical guidance and pathways during the COVID-19 pandemic required review with consideration of developing COVID-19 minimised, and COVID-19 'hot' services. For the endoscopy service, these pathways help to prioritise patients for emergency endoscopy at times when resources may be reduced due to available staffing and personal protective equipment (PPE).[11] Therefore, we believe our easily reproducible pathway, which appears to reduce the requirement for inpatient endoscopy in a relatively safe manner, may be applied in other centres during peak times of the pandemic. This may be relevant for some time, given ongoing waves of infection and the appearance of numerous variants of the virus.

A marked reduction in hospital presentations with non-respiratory illness during the COVID-19 pandemic has been observed.[12] In particular, fewer attendances with UGIB have been reported.[13 14] A previous study comparing UGIB data to prepandemic UGIB data observed a statistically significant increase in 30-day in-hospital mortality during the pandemic.[13] Although the study was not able to demonstrate causation, it was postulated that the mortality increase was due to a secondary effect of the pandemic. We also observed a reduction in the number of patients presenting with UGIB per week during the pandemic compared with prepandemic levels. In addition, we observed an increase in 30-day all-cause mortality during the pandemic, although gastrointestinal bleeding-related mortality was similar. Contrary to the previous study,[13] our data show that the mean GBS at time of referral was significantly higher during the pandemic, with a lower proportion of patients presenting with GBS 0–3 compared with prepandemic data. This suggests that patients referred with UGIB during the pandemic were at higher risk of poor outcomes. The higher GBS and mortality rate are probably due to under-representation of lower risk patients, who may have avoided hospital due to the pandemic. Our 30-day mortality rate of 33.3% for pre-existing inpatients is consistent with other studies that show a significantly higher mortality in patients with UGIB who are already in hospital for another reason.[15 16]

Previous data describe both endoscopic findings and patient outcomes for those infected with the SARS-CoV-2 virus. Eighty-two patients in our study were clinically suspected to have COVID-19; however, only 14 were confirmed to have the SARS-CoV-2 virus on PCR testing. This may have been because PCR testing was not available to all patients at the time of the study, and that we know that PCR is not 100% accurate. There were no endoscopic findings unique to those patients with confirmed COVID-19, none rebled and we found that a positive PCR test was independently associated with mortality.

We are the first to implement and report a new threshold for UGIB endoscopy that can be used during times of severe pressure on hospitals during a pandemic. To our knowledge, this is also the largest study to date on UGIB outcomes during the COVID era. In addition, our multicentre design, prospective data collection, consistent practice and predefined clinical outcomes across sites should be considered strengths of the study. We also acknowledge the limitations. These include the fact that the five centres are all large, teaching hospitals, therefore the results may not be applicable to smaller hospitals. We did not include admission to intensive care units (ICU) as a parameter in our data collection sheet, therefore cannot report on this outcome. Access to ICU beds for patients with UGIB may have been restricted due to the pressures from other patients with SARS-CoV-2. In Scotland, there were 1282 hospital admissions with COVID-19 in the first week of our data collection, and only 16 in the final week.[17] However, the country remained in 'full-lockdown' throughout our study and endoscopy units remained under pressure during this period due to redeployment of staff, PPE use and availability, and increased procedure turnaround time. When comparing our data with prepandemic data, we were only able to directly compare data from three sites from a different time of year (spring vs autumn). However, we are unaware of any robust data showing different UGIB presentation rates and outcomes throughout the year. A small number of planned outpatient endoscopies for low-risk patients had occurred by the end of the data collection period; however, we were able to observe electronic clinical records throughout and know that no such patient re-presented to hospital or died within 30 days.

In conclusion, during periods of severe pressure on endoscopy services from COVID-19, extending the

low-risk threshold for inpatient endoscopy in acute UGIB to GBS 0–3 appears to be relatively safe and could be considered in other centres. The higher GBS and increased mortality of patients with UGIB during the pandemic are associated with the presentation of a reduced proportion of lower risk patients.

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