National Comparative
Audit of Blood Transfusion

BRITISH SOCIETY OF GASTROENTEROLOGY

NHS Blood and Transplant

UK 2022 Comparative Audit of Acute Upper Gastrointestinal Bleeding (AUGIB) and the use of Blood

January 2025

Royal College of Physicians

AUGIS
ASSOCIATION OF UPPER GASTROINTESTINAL SURGERY OF GREAT BRITAIN AND IRELAND

BSIR British Society of Interventional Radiology

BASL British Association for the Study of the Liver

Foreword by Dr. Andrew Douds

It gives me enormous pleasure to introduce the 2022 UK wide acute upper Gastrointestinal Bleeding (AUGIB) Audit report. This audit was undertaken as part of the audit programme for the National Comparative Audit of Blood Transfusion. The key stakeholders who were involved in the design and implementation of this UK wide prospective audit were the British Society of Gastroenterology (BSG), NHS Blood and Transplant (NHSBT), the Royal College of Physicians (RCP), the British Association for the Study of the Liver (BASL), the Association of Upper GI Surgeons (AUGIS) and the British Society of Interventional Radiology (BSIR).

AUGIB is a common medical emergency which requires significant resources and expertise to manage effectively. This report is very timely as the last audit was in 2007. Since that time there have been numerous advances in the management of this potentially life-threatening condition.

The 2022 audit demonstrates numerous major advances in the clinical and organisational management of AUGIB since 2007. The audit also highlights many opportunities for improvements in care and training which need to be addressed urgently.

In order to raise awareness of the pivotal findings of the audit and help improve the management of AUGIB we have included an Executive Summary with key recommendations.

Should colleagues have any questions regarding the audit please e mail the National Comparative Audit Programme Manager John Grant-Casey john.grant-casey@nhsbt.nhs.uk.

Finally, I would like to express my gratitude to all members of the UK AUGIB Steering Committee for their dedication, time and contributions that have brought the report to fruition. I must also thank NHSBT for providing unwavering support in running this large audit. Lastly sincere thanks to all sites that participated in the audit particularly given the huge pressures that colleagues were and remain under particularly in the post-COVID period. Without their significant contributions this audit would never have been completed. Many thanks to you all for your invaluable input.

Yours Faithfully

Dr Andrew Douds

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Chair of UK AUGIB Steering Committee

Former Chair of BSG Clinical Services and Standards Committee

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This audit has been a collaborative effort, requiring extensive time and effort from numerous staff members in each participating hospital. We would like to express our heartfelt gratitude to all individuals and institutions involved in the UK Comparative Audit of Acute Upper Gastrointestinal Bleeding (AUGIB) and the Use of Blood for their invaluable contributions and dedication. We believe that this audit provides essential and meaningful data at both the local and national level.

We are particularly appreciative of the doctors in training who participated in this audit, especially considering the challenges posed by post COVID-pandemic recovery. Their commitment and hard work have been vital to the success of this endeavour.

We also acknowledge the indispensable support of the medical, nursing, administrative, and audit department staff in each hospital. Their behind-the-scenes efforts have been instrumental in facilitating the smooth execution of this audit. A full list of participating hospitals can be found in Appendix One.

Special thanks go to the hospitals that agreed to pilot the audit, enabling us to refine and improve the process before full implementation. Without their cooperation and valuable feedback, this audit would not have reached its current level of effectiveness and comprehensiveness. These hospitals are:

Royal Berkshire Hospital, Reading, England

Wrightington Wigan and Leigh Teaching Hospitals NHS Foundation Trust, Wigan, England

University Hospital of Wales, Cardiff, Wales

Forth Valley Royal Hospital, Larbert, Scotland

Ulster Hospital, Dundonald, Belfast, Northern Ireland

We acknowledge the efforts of Mrs Isla Grant-Casey in supporting data handling, reviewing paper booklets for the clinical audit, and assisting with data entry.

We would also like to acknowledge the support of Dr. Anna Marfin, an internal medicine trainee from Oxford University Hospital, for her assistance with data cleaning and analysis of the trainee/trainer feedback data, as well as her help in drafting the additional audit report titled "UK 2022 Comparative Audit of Acute Upper Gastrointestinal Bleeding (AUGIB): Trainees and Trainers' Survey."

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We wish to acknowledge the diligent efforts of the project group for the UK Comparative Audit of Acute Upper Gastrointestinal Bleeding and the Use of Blood, whose expertise and dedication have been integral to the successful execution of this audit.

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Contents

Executive Summary

Introduction: The first UK-wide audit of the management of acute upper gastrointestinal bleeding (AUGIB) was conducted in 2007. A re-evaluation of current practices is necessary due to the introduction of new guidelines, better endoscopic therapies, and improvements in service delivery and endoscopy access since then. The 2022 UK Audit of AUGIB provides a comprehensive assessment of current practices, patient outcomes, and resource availability in AUGIB management across NHS hospitals. This re-audit, following the 2007 audit, highlights advances in clinical practice as well as areas where standardisation is essential to improve care quality and patient safety.

Methods and analysis: Consecutive, unselected presentations with AUGIB across all UK NHS hospitals were prospectively enrolled over a two-month period between May and July 2022 using a methodology similar to the 2007 audit. Data were collected on patient characteristics, comorbidities, anticoagulant use, transfusions, timing and type of diagnostic and therapeutic procedures, length of stay (LOS) and mortality. Clinical practices were audited against predefined minimum standards of care for AUGIB. Additional data were collected on the availability and organisation of care, as well as the provision of endoscopy training for specialist registrars. Descriptive analysis, drafting of the report, review and editing were all performed by Dr. Gaurav Nigam, with inputs and supervision from all members of the audit steering committee group.

Summary of Main Findings

- In-hospital mortality, rebleeding rates, and the need for surgery have declined compared to 2007, dropping from 10% to 8.8%, 13.3% to 9.7% and 1.9% to 0.7 %, respectively, despite patients being older, having more comorbidities (including chronic liver disease (CLD)), and increased use of anticoagulants.
- Routine implementation of care bundles remains limited, with usage reported in only 43% of hospitals. Additionally, many patients (40%) lacked pre-endoscopy risk stratification, leading to missed opportunities for improved planning and early intervention.
- Adherence to recommendations for managing variceal bleeding remains inconsistent with less than half of eligible patients receiving essential treatments such as antibiotics (44%) and terlipressin (49%).
- The use of red cell transfusions often deviated from national guidelines with 57% of patients eligible for a restrictive approach receiving transfusions outside the guidelines. This was particularly common among stable patients without clinically significant bleeding, thus exposing them to unnecessary risks including higher risk of rebleeding and mortality.
- In-patient endoscopy has increased compared to 2007, rising from 74% to 83%, along with greater use of therapeutic endoscopic interventions (23% in 2007 to 27.1% in 2022) and interventional radiology (IR) (1.2% in 2007 to 2.6% in 2022).
- While the cause of bleeding was identified for most patients on endoscopy, about a third (34%) had no abnormalities detected and may not have required urgent endoscopy or endoscopic therapy. This underscores the need for better risk stratification to optimise resource allocation.
- Access to out-of-hours (OOH) endoscopy remains available in 92% of hospitals, similar to 2007, but is not yet universal. Notable improvements in on-call staffing and trained nursing support reflect a more structured approach to emergency care.
- On-site IR availability has increased from 23% in 2007 to 65% in 2022, but only 44% of hospitals offered 24/7 IR service, leaving critical gaps in care.
- Trainees face limited opportunities to gain hands-on experience in managing AUGIB, emphasising the importance of supervised training and formal haemostasis courses.

Figure 1 – Audit summary

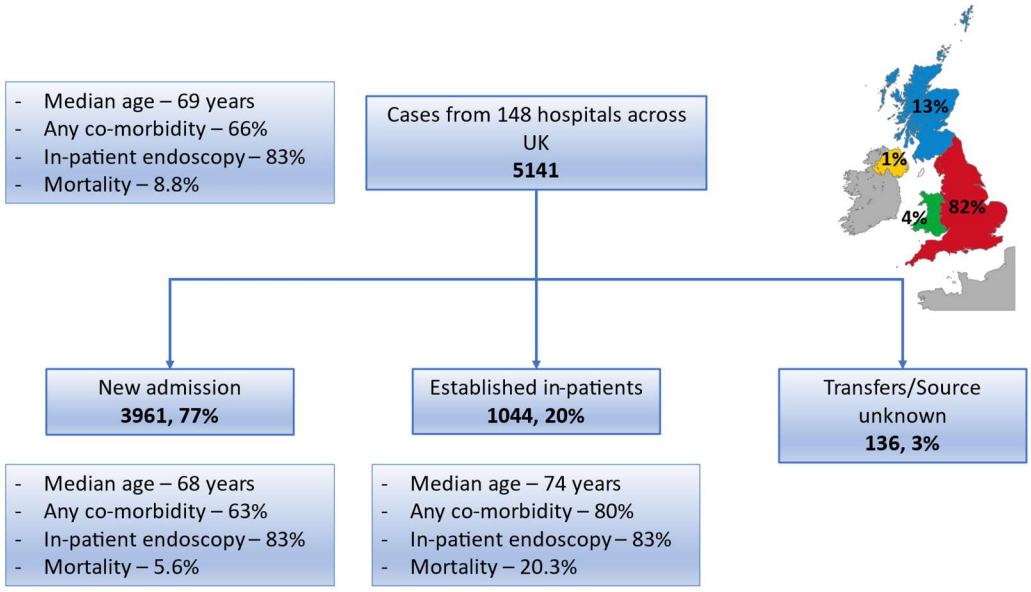

Figure 2 – Comparative analysis of 2022 re-audit with 2007 audit

	2007 (n=6750)	2022 (n=5142)	p value
Inpatient endoscopy	74%	83%	<0.05
PUD	36%	30%	<0.05
Varices	11%	9%	0.13
Use of endoscopic therapy	24%	27%	<0.05
Further bleeding after index endoscopy	13%	10%	<0.05
Surgery	1.9%	0.8%	<0.05
IR	1.2%	2.6%	<0.05
Transfusion ≥1 unit			
PRC	43%	49%	<0.05
Platelets	2.8%	4%	<0.05
FFP	7%	5%	<0.05
Median LOS	5 days (IQR 2-12)	5 days (IQR 3-10)	NA
In-hospital mortality	10%	8.8%	<0.05

	2007 (n=6750)	2022 (n=5142)	p value
Median age	68 yr (IQR 49-81)	69 yr (IQR 54-80)	NA
Any (>=1) comorbidity	50%	66% ↑	<0.05
Medications			
NSAID	11%	7% ↓	<0.05
Antiplatelets	33%	21% ↓	<0.05
Anticoagulants	13%	31% ↑	<0.05
Other			
Alcohol use	26%*	30%	NA
Chronic Liver Disease	9%	16% ↑	<0.05

* 2007 audit captured information on alcohol abuse defined as consumption/week of >21 units for males and >14 units for females

Key Recommendations:

Clinical Care

- Ensure consistent implementation of validated risk scores and the British Society of Gastroenterology (BSG) AUGIB consensus care bundle at presentation, particularly in emergency departments (ED) and acute medical units (AMU).
- Adhere to national guidelines for restrictive thresholds for red cell transfusions (Haemoglobin (Hb) <70 g/L for stable patients, except in acute coronary syndrome (ACS)). Use single-unit red blood cell (RBC) transfusions for stable patients and reassess the patient's clinical status and Hb before transfusing further units.
- Increase adherence to guideline-recommended management plans for patients with variceal and non-variceal bleeding.
- Focus on strategies to reduce unnecessary endoscopies, especially for low-risk patients, to optimise resource utilisation.

Organisational Care

- Ensure protected daily emergency endoscopy slots and formal 24/7 on-call endoscopy rotas.
- Address gaps in access to interventional radiology, including formal networks for transfer and repatriation. Aim for universal availability of minimally invasive haemorrhage control techniques. Establish clear pathways for timely access to interventional radiology (IR) and transfer for centres lacking on-site 24/7 IR or surgical services.
- Conduct annual local audits on AUGIB management, focusing on transfusion practices, care bundle compliance, and training gaps.

Training

- Improve trainee access to AUGIB cases and therapeutic endoscopy through increased supervision and structured involvement on semi-elective inpatient lists and in on-call rotas during the final years of training.
- Promote attendance at the Joint Advisory Group on Gastrointestinal Endoscopy (JAG) Haemostasis Course for trainees managing AUGIB.
- Ensure future iterations of training curricula include endoscopic haemostasis as a core competency.

Additional recommendations

- Encourage regional collaboration between hospitals to standardise AUGIB care delivery, particularly for complex cases requiring IR or surgery.

Strengths and Limitations

- The audit follows prospective case identification, allowing identification of all AUGIB patients within the audit period, using a similar methodology to the 2007 audit.
- Comprehensive data were collected on management, including endoscopic timing, pre-and post-endoscopic management, need for interventions, LOS, further bleeding, the use of blood transfusions, readmission, and mortality, as well as organisational and training resources.
- Data quality may vary due to reliance on accurate local record-keeping and clinician-reported data.
- The COVID-19 pandemic affected clinical practice and training, which may have had an impact on data capture.

Operational Challenges: The audit encountered logistical challenges, affecting data collection and quality. Data collectors often received limited guidance due to inconsistent consultant supervision, and the online data entry system faced technical limitations, leading to delays and additional data entry burdens on NHS Blood and Transplant staff. Furthermore, date formatting inconsistencies complicated data cleaning and analysis, highlighting the need for improved IT infrastructure and better support for resident doctors and healthcare professionals participating in national audits of significant importance to improve clinical practice.

Ethics and dissemination: this audit was conducted as part of the National Comparative Audit of Blood Transfusion through collaboration with specialists in gastroenterology, haematology, surgery, and interventional radiology. Individual site reports with key highlights have been provided alongside this detailed UK-wide report with further dissemination planned through specialist societies and publications in peer-reviewed journals. The audit was funded by NHS Blood and Transplant and the British Society of Gastroenterology, and endorsed by the Royal Colleges of Physicians, the British Association for the Study of the Liver, the Association of Upper Gastrointestinal Surgery of Great Britain and Ireland and the British Society of Interventional Radiology.

Conclusions The 2022 audit shows progress in AUGIB management across the UK with reductions in recurrent bleeding, surgical interventions, and in-hospital mortality, even among a more comorbid patient population. These improvements reflect advances in endoscopic therapy, transfusion practices, and overall care strategies. However, gaps remain in areas such as use of the BSG consensus AUGIB care bundle, adherence to guidelines for restrictive red cell transfusion, weekend endoscopy list availability, and training, highlighting areas for targeted improvement. This audit underscores the need for enhanced risk stratification, triage, and resource allocation to sustain gains made since 2007. The large dataset collected provides a potential foundation for applying novel methodologies, including machine learning (ML), to improve risk assessment, clinical management, and patient outcomes. Addressing the identified disparities and operational challenges should help NHS hospitals deliver consistent, high-quality care for this complex patient population.

Note

This report presents key highlights from the 2022 UK AUGIB audit. Further detailed publications are planned to address additional areas of clinical uncertainty and provide in-depth analysis of specific management aspects, including the impact of changes in organisational care on outcomes, comprehensive evaluation of endoscopy and transfusion data, focused insights into variceal management and care for patients with chronic liver disease, and the development of updated prediction tools. These future studies will also explore novel methodologies, such as machine learning approaches, to enhance risk stratification and improve patient outcomes.

Definitions and Abbreviations

Term	Definition
Clinically significant bleeding	Bleeding characterised by systolic blood pressure below 100 mmHg, heart rate of 100 or higher, and the need for at least one unit of red cell transfusion.
Upper gastrointestinal bleeding	Bleeding that occurs in the gastrointestinal tract above the ligament of Treitz
Lower gastrointestinal bleeding	Bleeding that occurs in the gastrointestinal tract below the ligament of Treitz
Major haemorrhage	Bleeding severe enough to activate a Major Haemorrhage Protocol.

Abbreviation	Definition
ACS	Acute coronary syndrome
AUGIB	Acute upper gastrointestinal bleeding
AUGIS	Association of Upper Gastrointestinal Surgery of Great Britain and Ireland
BASL	British Association for Study of Liver diseases
BSG	British Society of Gastroenterology
DOAC	Direct oral anticoagulant
ED	Emergency department
EQIP	Endoscopy Quality Improvement Project
FFP	Fresh frozen plasma
GAVE	Gastric Antral Vascular Ectasia
GBS	Glasgow-Blatchford Score
GI	Gastrointestinal
Hb	Haemoglobin
HDU	High Dependency Unit
INR	International normalised ratio
IQR	Interquartile range
IR	Interventional Radiology
ITU	Intensive Therapy Unit
IV	Intravenous
JAG	Joint Advisory Group on Gastrointestinal Endoscopy
LMWH	Low molecular weight heparin

LOS	Length of Stay
ML	Machine-learning
MHP	Major Haemorrhage Protocol
NHSBT	NHS Blood and Transplant
NEWS	National Early Warning Score
NICE	National Institute for Health and Care Excellence
NSAIDs	Non-steroidal anti-inflammatory drugs
NSBB	Non-selective beta blockers
NVUGIB	Non-variceal upper gastrointestinal bleeding
VUGIB	Variceal upper gastrointestinal bleeding
OGD	Oesophagogastroduodenoscopy
OOH	Out of hours
PBM	Patient blood management
PCC	Prothombin Concentrate Complex
PPI	Proton pump inhibitors
PUD	Peptic ulcer disease
RBC	Red blood cell
RCT	Randomised controlled trials
RBC	Red Blood Cells
TIPSS	Transjugular Intrahepatic Portosystemic Shunt
TXA	Tranexamic acid
UGIB	Upper gastrointestinal bleeding
UK	United Kingdom
UGI	Upper Gastrointestinal

Key Results

Data from 5141 patients (median age 69 years, Interquartile Range [IQR] (54-80) across 147 hospitals are reported. At presentation, 67% (3427) had at least one comorbidity, 30% (1540) had a history of regular alcohol use, 7% (382) were taking non-steroidal anti inflammatory drugs (NSAIDs), 22% (1117) were on antiplatelets, and 31% (1572) on anticoagulants. Inpatient endoscopy was performed in 83% (4279) of cases, revealing peptic ulcer disease (PUD) in 31.4% and varices in 10%. Endoscopic therapy was provided in 27.1% of cases. Among patients who did not undergo endoscopy (862), reasons included no clinical indication (54%), not for active treatment (18%), self-discharge (7%), transfer to another hospital (1%) and death (6%).

In-hospital mortality was 8.8% (451), with 5.6% for new admissions and 20.3% for established inpatients.

Further in-patient bleeding post-index endoscopy was observed in 9.7% (414/4279), with 9% (437) of patients requiring more than one endoscopy during their stay. Surgical intervention was needed in 0.7% (38) of cases, while IR was utilised in 2.6% (133). Blood transfusions were administered to 50% (2561) of patients, with 4% (208) receiving platelets and 5% (280) fresh frozen plasma (FFP). The median LOS was 5 days (IQR 3-10).

Comparisons with the 2007 audit reveal key changes in patient profiles and management in the 2022 re-audit. There was a decrease in further in-patient bleeding after index endoscopy (13.3% to 9.7%), need for surgery (1.9% vs. 0.7%), and in-hospital mortality (10.0% to 8.8%). Comorbidity prevalence rose from 50% to 67%, anticoagulant use from 13% to 31%, and CLD prevalence from 9% to 15%. Inpatient endoscopy rates increased from 74% to 83%, with decreases in PUD diagnosis (36.5% vs. 31.4%) and stable rates of varices (11% vs. 10%), despite a higher prevalence of underlying liver disease. Endoscopic therapy use rose from 23% to 27.1%, and IR procedures from 1.2% to 2.6%.

Organisation insights: Data from 121 NHS hospitals show advances in AUGIB management since 2007. Hospitals reported varied caseloads, with 42% managing >300 cases annually, 30% managing 101-200 cases, 17% managing 201-300 cases, and 7% handling fewer than 100 cases. Access to critical care has improved, with 92% of hospitals now equipped with high dependency (Level 2) units and 97% with intensive therapy (Level 3) units, compared to 91% and 95%, respectively, in 2007. However, only 54% of hospitals have a designated lead for GI bleeding governance, indicating a potential area for standardisation.

Nearly all hospitals (99%) have an on-site endoscopy unit, and 92% offer OOH endoscopy access, similar to 2007 levels. The availability of a formal OOH endoscopy rota has increased substantially, from 56% in 2007 to 94% in 2022, with median endoscopist staffing rising from 6 (IQR 5-8) in 2007 to 10 (IQR 7-12) in 2022 and the total number of endoscopists on the on-call rota across participating hospitals increasing from 638 in 2007 to 1073 in 2022. Access to trained OOH nursing staff also improved from 53% to 83%. Access to on-site IR expanded significantly, from 23% of hospitals in 2007 to 65% in 2022, with 44% offering 24/7 IR coverage and 37% providing on-site access for trans-jugular intrahepatic portosystemic shunt (TIPSS). Emergency surgery availability increased from 73% to 97%, and transfusion labs are now on-site in 98% of hospitals, up from 96% in 2007.

Standardisation of AUGIB policies remains mixed. Written AUGIB management policies are present in 79% of hospitals, with 66% offering separate protocols for variceal and non-variceal bleeding. AUGIB care bundles are used routinely in only 43% of hospitals, but routine auditing increased to 89%, up from 84% in 2007.

Introduction

Acute upper gastrointestinal bleeding (AUGIB) is a medical emergency, with approximately one presentation reported every six minutes in the United Kingdom (UK) and an annual incidence of 134 per 100,000.[1] It accounts for approximately 11% of the total red blood cell (RBC) units transfused in hospitals across England.[2] Although mortality among new admissions with AUGIB in the UK is 7%, it was reported to be 26% among inpatients in 2007.[3] AUGIB was the subject of a national audit in 2007, which captured data on 6750 patients from 212 hospitals.[3,4] This audit informed several subsequent publications including the 2012 National Institute for Health and Care Excellence (NICE) guidelines on AUGIB, the CHROME statement on services for AUGIB and the 2015 National Confidential Enquiry into Patient Outcome and Death report on gastrointestinal (GI) bleeding.[5–7] It also highlighted that early RBC transfusion in AUGIB was linked to a two-fold increase in rebleeding risk and a numerically higher mortality rate, potentially due to the liberal transfusion approach.[8] This finding prompted the development of a cluster randomized trial to compare restrictive versus liberal transfusion strategies.[9] More recently, a UK multi-society care bundle has been developed for use within the first 24 hours of presentation with AUGIB.[10]

Initiatives to improve services for AUGIB, including improved provision of 24/7 access to emergency endoscopy, imaging and IR, developments in care pathways and changes to blood transfusion practice have been implemented since the 2007 audit. There has also been a change in case mix, with an increase in liver disease amongst the younger population probably resulting in increased proportions of variceal upper gastrointestinal bleeding (VUGIB) and a potential reduction in non-variceal upper gastrointestinal bleeding (NVUGIB) related to increased use of proton pump inhibitors (PPI).[11,12] Several major randomised controlled trials conducted since 2007 may have influenced aspects of clinical practice.

RBC transfusion in AUGIB has been the subject of two large randomised controlled trials : the Barcelona trial, which showed improved outcomes with a restrictive transfusion strategy (Hb threshold <7 g/dL), including lower mortality (5% vs 9%) and further bleeding rates (10% vs 16%); and the TRIGGER trial, a UK cluster-randomised feasibility study comparing restrictive (threshold 8 g/dL) and liberal (threshold 10 g/dL) transfusion strategies, which demonstrated feasibility of implementing different transfusion policies across multiple centres and found no significant difference in clinical outcomes between the two strategies.[9,13] The HALT-IT trial found no significant benefit of tranexamic acid (TXA) in reducing death due to bleeding (4% vs 4%) or all-cause mortality (9% vs 9%) in AUGIB, and raised potential concerns about thromboembolic risks, suggesting caution in its routine use for this indication.[14] It is unknown how the latest evidence has been incorporated into treatment pathways. With changes to demographics, including a multi-morbid ageing population, polypharmacy (including the increasing use of antiplatelet and anticoagulant therapies) and changing socioeconomic factors, a reassessment of who our patients are, how they present and how they are managed is needed.

Furthermore, the BSG's Endoscopy Quality Improvement project aims to support quality improvement in management of gastrointestinal bleeding.[15] There are initiatives by this project to ensure hands-on training for endoscopists. A UK survey in 2020 noted that 88% of trainees expressed the need for additional training in endoscopic haemostatic procedures.[16] Therefore, it becomes important to understand the currently available resources for training in the endoscopic management of AUGIB.

There also remains clinical uncertainty in several areas of decision-making, despite multiple changes in management strategies over the last two decades. These include:

- Appropriate assessment and adoption of risk prediction tools in clinical practice for triaging of patients at presentation to identify low-risk individuals who can be discharged, and patients at risk of dying, or needing hospital-based intervention (transfusion, therapeutic endoscopy, IR or surgery);
- The influence of concurrent medication or comorbid conditions on clinical outcomes;
- Individualising transfusion plans to avoid transfusion-related complications and unnecessary use of blood products according to the principles of patient blood management (PBM);
- Streamlining allocation of hospital resources by optimal timing of endoscopy or other interventions including transfusion, surgery and IR procedures;
- There is also a need to communicate with patients, family, and healthcare professionals to manage expectations about the risk of complications and mortality, as well as estimated discharge dates when people present to the hospital with AUGIB.

These remain important avenues of research to generate robust evidence and further improve management of AUGIB. The optimal risk stratification score for predicting low-risk patients and identifying those at higher risk of mortality have been extensively studied, but there is a lack of consensus on optimal thresholds for discharge or intervention.[17] More recently the use of ML has been suggested as a potential alternative to predict prognosis in AUGIB.[18] Large datasets are needed to effectively establish such ML models.

Aims and Objectives

Comparative audit involves collection of organisational and individual patient data from hospitals, with feedback of the results so that sites can compare their practice with others. This is linked with strategies for improvement in practice involving education and the development of achievable benchmarks. In other areas of medicine, clinicians and hospital managers have found the comparative data presented in this way to be sufficiently persuasive to justify introducing change locally.[19] The purpose of this re-audit of AUGIB, as a collaboration between UK hospitals, NHS Blood and Transplant, Royal College of Physicians, BSG, British Association for the Study of the Liver, Scottish Society of Gastroenterology, AUGIS and British Society of Interventional Radiology is to influence organisation, training and performance in the management of patients with AUGIB over the next 15 years.

Objectives

To collect data from all NHS acute admitting hospitals in the UK regarding numbers, demographics, management and outcomes of patients presenting with AUGIB.

To assess changes to patient population related to aetiology and clinical presentations with AUGIB compared to 2007.

To audit resource availability, both within normal working hours and OOH (including at weekends), regarding access and use of emergency endoscopy, IR and surgery.

To audit the following against UK / NICE standards / AUGIB care bundle recommendations and 2007 audit results and identify variation in practice:

  - time taken from presentation to any specialist intervention (endoscopy/IR/surgery);
  - use of endoscopic therapies for patients with AUGIB;
  - use of specific drug therapies (e.g. PPIs, terlipressin, antibiotics and TXA);
  - transfusion practices for these patients including thresholds for red cell transfusion and use of FFP, platelets and other products;
  - quantify the use of antiplatelet and anticoagulant medications in patients presenting with AUGIB, and audit the management of these patients.
- To measure the use and impact of risk scoring systems for patients presenting with AUGIB and compare the utility of commonly used risk scores i.e., Glasgow-Blatchford score (GBS), Rockall score, and other risk scores including the recently developed ABC score. [20–24]
- To make recommendations based on findings on OOH care, blood use, endoscopy, optimal use and timing of IR and surgery and any other factors that are highlighted as having a clinically significant impact on patient outcomes.
- To explore the use of ML to develop tools for risk assessment.
- To review the involvement of GI trainees in the endoscopic management of AUGIB.

Methodology

225 NHS Trusts and Board in the UK that accept acute, adult admissions were invited to participate. Hospitals that focus on children or non-related specialities such as maternity hospitals or neurological units were not asked to participate. Independent hospitals were not invited to participate since GI bleeds are managed in the NHS. Each NHS hospital site in the UK admitting acute medical and surgical admissions was eligible for enrolment for this audit. In England 128/184 (70%) NHS Trusts participated, while this figure was 4/7 (57%) for Trusts in Northern Ireland, 15/19 (79%) of Boards in Scotland and 8/16 (50%) of Boards in Wales. The overall NHS participation rate was 155/225 (69%), with 147 sites able to contribute clinical data.

The audit protocol, including the questionnaires, is available online: https://osf.io/zet8r/ and the main methods are summarised below:

Recruitment of sites

A letter and email giving details of the audit was sent to the Chief Executive, Medical Director and Clinical Audit Manager in each NHS Trust and Board. Electronic copies were also sent to Hospital Transfusion Laboratory Managers, Transfusion Practitioners, and Consultant Haematologists with responsibility for blood transfusion. Notices advertising the audit were put in the BSG newsletter, on the BSG website and on the National Comparative Audit of Blood Transfusion web page. The audit was also publicised on social media (Twitter). Non-responders were sent a reminder letter to CEOs, Medical Directors and Endoscopy leads in April 2022. If no response was received, an attempt was made by the project group to contact individual endoscopy leads by telephone or email (where the details are available from the BSG). A list of hospitals completing the audit, hospitals agreeing to the audit but not submitting data and non-responding hospitals is included (Appendix One).

The nature and size of the case sample

All unselected patients with suspected or overt AUGIB either presenting to a hospital or occurring in patients already hospitalised for another reason, within a 2-month period, starting on 3rd May 2022, were to be considered eligible for inclusion. Patients did not need to have had a blood transfusion/endoscopy to be eligible. Case identification was based on presenting symptoms as opposed to findings on investigations or discharge diagnoses. Cases were eligible if they fulfilled the following criteria: age ≥16 years; presented to ED or admitted to an adult medical or surgical ward; suspected, or confirmed AUGIB (melaena, haematemesis, shock / syncope, coffee ground vomiting). This would include all ED attendances with suspected or confirmed AUGIB even if they had been discharged straight from ED. Patients presenting with symptomatic iron deficient anaemia but no signs of AUGIB were to be excluded. A study linking the 2007 audit data to Hospital Episode Statistics recorded reassuringly similar numbers for AUGIB hospital admissions and procedures during the period of the audit. This highlights that this method of case ascertainment is accurate in AUGIB.[25]

The case identification criteria in the present re-audit are similar to those used in 2007. However, due to the adoption of strategies to discharge low risk patients from EDs, some patients who previously would have been admitted may now be immediately discharged for outpatient management. These patients would have been captured in the 2007 audit, but missed in the present re-audit if case capture was limited to admitted patients. To mitigate this, low-risk patients who were discharged straight from ED were also included. There were no established outpatient care pathways at the time of the initial audit in 2007 and this inclusion was designed to help capture all cases of AUGIB.

Data were collected until patient death in hospital, hospital discharge, or until the patient had been in hospital for more than 28 days following their AUGIB (whichever occurred first). Readmission data were collected until 28 days post discharge. This meant that some follow-up data continued to be collected after the recruitment period. Patients who were re-admitted (between 3rd May until 2nd July 2022, only) with another episode of AUGIB were included as a new episode for the purpose of the audit data collection.

Questionnaire design

The questionnaires were piloted at five eligible sites in the UK between November-December 2021. Each site was asked to review the questionnaires and record feasibility of data collection for each question via a standardised grading system. All mandatory questions were deemed feasible and information accessible. The remainder of the questions were reviewed and clarified. No questions were excluded, but wording and phrasing was amended for questions deemed ambiguous based on the pilot exercise. Answers were also reviewed to ensure data were interpretable and reproducible.

Individual patient data

The 2007 AUGIB audit questionnaire was updated for use in this repeat audit. (https://osf.io/ngjh7) The questionnaire included information on demographics, patient presenting features, clinical observations, laboratory measures, blood transfusion, medication use (both before and after presentation), use of therapy (endoscopic, transfusion, IR and/or surgery), re-bleeding, LOS and mortality. The questionnaire captured more detailed information on management of patients with variceal bleeding and/or underlying liver disease than the 2007 audit.

Organisational audit

This comprised a questionnaire to assess organisational factors such as the presence or absence of treatment protocols on AUGIB and their content, the use of risk assessment tools and specific guidance on blood transfusion. (https://osf.io/y259w) It also sought information on additional acute medical/surgical on-call commitments for consultants as well as their participation in an AUGIB rota. Other questions measured the availability of emergency endoscopy, IR (including transfer of patients and repatriation policies), surgery and endoscopy nurse cover. Data on all the above were requested separately for in- and OOH, including at weekends.

Training resources audit

There was an additional section exploring current involvement and training opportunities for trainees in management of AUGIB. This was completed by the clinical lead for gastroenterology or endoscopy. We also sought information from individual trainees on their perceived competence levels for management of AUGIB.

Operating the audit

This was a UK-wide audit which aimed prospectively to enrol all patients presenting with, or developing AUGIB while an established inpatient. Hospital sites were recruited from March 2022. Case identification lasted for a 2-month period (3rd May 2022 to 2nd July 2022) and data collection with information on a follow-up period of 28 days for the included patients closed in August 2022. Each participating NHS trust had a team that included a named consultant lead, a clinical audit lead, case identifiers, and numerous data entry personnel to gather the information. The audit lead ensured that cases were being identified and that data entered was complete and correct. Although they could be from any specialty, the leads were primarily gastroenterology consultants or specialist registrars.

Data collection

All data were intended to be obtained concurrently from patient notes and electronic hospital records. A unique code was allotted to cases and sites to enable data entry without breaching patient confidentiality. Anonymised clinical information for each eligible case was to be entered into an online questionnaire that could only be accessed by using a site-specific password. To make it easier to gather data from areas without adequate computer access, paper versions of the questionnaire were also provided. For electronically completed data, the website automatically downloaded all data into a central database in real-time. This enabled periodical counts of the registered cases and tracking of the participants' progress. Once the participating site was satisfied that it had entered a complete data set, a tick box finalised the data set. The project team was then informed that the data entry for the case was complete, and the data set was reviewed for any mandatory information that was omitted, or any potentially erroneous responses. If additional or corrected data were required, audit leads within each institution were notified.

These reviews took place daily over the audit period and thereafter to guarantee that the data were accurate and complete. The project team also assessed any cases that were unfinished but inactive for longer than a week, in order to ensure contemporaneous data collection. They then contacted the hospital lead to promote their completion.

Audit standards were applied to the AUGIB cohort to be included for the main analysis, cases were grouped, where relevant, to allow comparative analysis particularly focusing on risk factors for poor outcome. Proposed subgroups include established inpatients and de novo presentations, transferred and non-transferred patients and groups stratified by comorbid status, concurrent medications, VUGIB vs NVUGIB, in- and out-of-hours presentation, and risk assessment scores. Risk assessment scores (Glasgow-Blatchford scores) were computed for all patients using the raw audit data. Analysis was carried out to identify the percentage of patients requiring specific hospital interventions, mortality, repeat bleeding, length of stay and readmissions.

Descriptive analysis, drafting of the report, review and editing were all performed by Dr. Gaurav Nigam, with inputs and supervision from all members of the audit steering committee group.

Audit Standards

The audit standards were based on recommendations from the 2007 UK audit, NICE guidelines on AUGIB and transfusion, National Confidential Enquiry into Patient Outcome and Death report on GI haemorrhage, UK and European guidelines on AUGIB and BSG led multi-society AUGIB care bundle.[6,7,10,26–32] In areas where no guidelines exist, expert opinion was sought. Organisation of services and principles of patient care were audited against an amalgamation of these standards, as detailed below.[33–35]

Audit standards for clinical management[6,10,27–32]

Relevant audit standard	Specific measure	Practice recommendations
Patients with suspected or overt AUGIB in the absence of an alternate diagnosis (e.g. bowel obstruction) trigger the AUGIB bundle [10]	Use and documentation of BSG-led multi-society consensus care bundle in clinical notes	To ensure relevant recommendations from BSG care bundle are actioned for patients presenting with AUGIB
Risk assessment:[10] - Formal risk assessment scores are used for all patients with AUGIB - Patients with suspected AUGIB have urgent observations performed using a validated early warning score such as the National Early Warning Score (NEWS) - There is consideration of early discharge for low-risk patients	Use and documentation of GBS at presentation Use and documentation of validated early warning scores Percentage of low-risk patients (GBS ≤1) admitted vs. discharged for out-patient management	Consider early discharge and outpatient management for patients with GBS ≤1 (unless another reason for admission)
Resuscitation and initial management:[6,10,27–30] - All patients with AUGIB are commenced on intravenous (IV) fluids - Patients with AUGIB with ongoing haemodynamic instability are referred for critical care review - Patients with cirrhosis receive vasoactive drugs e.g. terlipressin (or octreotide, if contraindicated) and antibiotics - Patients with AUGIB are not given tranexamic acid	Pre-endoscopic use of IV fluids for all (admitted) cases of AUGIB Use of TXA in patients with AUGIB Use of antibiotics as per local policy in all patients with cirrhosis and AUGIB; and terlipressin (or octreotide if contraindicated) started as soon as variceal bleeding suspected Number of RBCs, platelets, FFP, PCC and cryoprecipitate transfusions per patient	Recommendation in haemodynamically unstable patients is for initial administration of a crystalloid solution as a bolus of 500 mL in less than 15 min. Escalation of care for clinically significant bleeding and documentation of ceiling of care Intubation is recommended before endoscopy in selected patients with altered consciousness and those actively vomiting blood[28,31]

- RBC transfusion follows a restrictive protocol (trigger: Hb <70 g/L; target: 70–100 g/L). [10] Transfusion policy in individual patients includes the consideration of other factors such as cardiovascular disorders, or ongoing bleeding with haemodynamic instability - FFP a. When a patient's fibrinogen level remains less than 1 g/L despite fresh frozen plasma use, offer cryoprecipitate as well [30] b. In the setting of suspected or known variceal bleeds, transfusion of FFP is not supported (as it may lead to volume overload and worsening portal hypertension without correction of the underlying coagulopathy) [29,31] - Cryoprecipitate Transfusion is considered for patients without major haemorrhage who have clinically significant bleeding and a fibrinogen level below 1.5 g/litre.	Threshold and target Hb, platelets and clotting parameters Frequency of inappropriate or unnecessary use of RBCs, platelets, FFP and cryoprecipitate Number and percentage of patients that trigger a massive haemorrhage alert	Appropriate indication for transfusion of blood products In the setting of variceal bleeding, platelet count and fibrinogen levels do not appear to correlate with risk of failure to control bleeding or rebleeding. In this situation, the decision to correct haemostatic abnormalities should be made based on individual patient circumstances.[31]
Restrictive red blood cell transfusion thresholds (≤70 g/litre) are used for patients who need red blood cell transfusions and who do not have major haemorrhage or acute coronary syndrome (NICE 2015).[39]		

A haemoglobin concentration target of 70–90 g/litre after transfusion is used for patients who need red blood cell transfusions and who do not have major haemorrhage or acute coronary syndrome (NICE 2015).[39]		
Platelets are given in active AUGIB with a platelet count ≤50x10^9/L, as per MHPs		
FFP is offered to patients who are actively bleeding (non-variceal) and have a prothrombin time (or international normalised ratio (INR)) or activated partial thromboplastin time greater than 1.5 times normal [30]		
Use and impact of concurrent medications:[10,27–29] - Continue aspirin at presentation - Interrupt P2Y12 inhibitors (clopidogrel, Prasugrel or Ticagrelor) until haemostasis is achieved - Interrupt warfarin therapy at presentation - Offer PCC to patients who are taking warfarin - Interrupt direct oral anticoagulant (DOAC) therapy at presentation - Use of a DOAC reversal agent or IV PCC is considered in patients with severe ongoing bleeding	Prevalence of antiplatelet use, number/proportion of patients with antiplatelets withheld at time of presentation with AUGIB, effect of antiplatelet use on severity of bleeding and outcomes Prevalence of anticoagulant and DOAC use, number/proportion of patients with anticoagulants and DOACs withheld at time of presentation with AUGIB, effect of anticoagulant and DOAC use on severity of bleeding and outcomes Methods of anticoagulant reversal	For patients with coronary artery stents a decision on interrupting P2Y12 should be undertaken after discussion with a cardiologist

Timing of endoscopy: [6,10,27–29] - Endoscopy is offered within 24 hours of presentation with suspected AUGIB - Offer urgent* endoscopy after resuscitation for patients with ongoing haemodynamic instability	Proportion of (admitted) haemodynamically stable patients who have oesophagogastroduodenoscopy (OGD) <24 hours Median waiting time to OGD for hemodynamically stable and unstable patients Correlation of waiting time to OGD and outcomes	
Endoscopic management:[6,27–29] - Endoscopic therapy is utilised for ulcers with active bleeding (Forrest 1a and 1b) and non-bleeding visible vessels (Forrest 2a) and may also be used for ulcers that have adherent clots (Forrest 2b) - Choice of therapy includes: Injection therapy (e.g. adrenaline), thermal probes (e.g. bipolar electrocoagulation, heater probe), or clips - A second modality (thermal or mechanical therapy) is always used following adrenaline injection - Recurrent bleeding is treated with repeat endoscopic therapy, but subsequent bleeding by trans-arterial embolization or surgery - Band ligation is the preferred treatment for oesophageal variceal bleeding and injection of tissue adhesive (cyanoacrylate or thrombin) for GOV-2 and isolated gastric varices	Findings on endoscopy; modality used, success of endoscopic haemostasis and frequency of repeat endoscopy (for 2nd look or rebleeding) Number of endoscopies required to reach a diagnosis and achieve haemostasis	

Post- endoscopic management: [10,27–29,31] - High dose PPIs are used for 72 hours either as continuous infusion, intermittent IV bolus or high dose oral in patients with high-risk ulcers (active bleeding, visible vessel, adherent clot) - Antibiotics are continued for up to seven days in patients with cirrhosis regardless of the bleeding source - Vasoactive drugs are used for up to five days for VUGIB - A clear plan for resumption of antithrombotic therapy is included, if interrupted, for patients with AUGIB - If bleeding is difficult to control, a Sengstaken– Blakemore tube (or removable covered metal stent) is inserted until further endoscopic treatment, TIPSS or surgery is performed depending on the clinical circumstances, local resources and expertise - Salvage TIPSS is offered where feasible for refractory variceal bleeding - Secondary prophylaxis is initiated prior to hospital discharge in all patients with variceal bleeding i.e. non-selective beta blockers (NSBB)/band ligation/TIPSS depending on the clinical circumstances	Use and duration of PPI, antibiotics and vasopressors in relation to type of AUGIB as per endoscopy findings Documentation of plan as per endoscopy report Number and percentage of patients with variceal bleed initiated on secondary prophylaxis prior to hospital discharge Frequency and outcomes of embolization, TIPSS, surgery Number of referrals for TIPSS following a VUGIB and median duration from date of bleed to date of TIPSS if performed; and whether inserted for salvage, pre-emptive, or rebleeding reasons	A repeat endoscopy should be arranged within 6-8 weeks for patients identified to have a bleeding gastric ulcer.[32] The risk benefit ratio of secondary prophylaxis TIPSS (+/- embolisation) should be considered in patients with oesophageal variceal bleeding who rebleed despite band ligation and nonselective beta blockade, and in patients with gastric or ectopic variceal bleeding

Outcomes:	Rebleeding rates (and time of rebleeding) In-hospital mortality and cause of death 28-day readmissions (further AUGIB) LOS	

*definitions regarding the timing of Upper Gastrointestinal (UGI) endoscopy in AUGIB relative to the time of patient presentation: urgent ≤ 12 hours, early ≤ 24 hours, and delayed > 24 hours.[28]

Organisational audit standards[33–35]

Recommendations	Specific measure
Patients with any acute GI bleed are only admitted to hospitals with 24/7 access to on-site endoscopy, IR (on-site or covered by a formal network), on-site GI bleed surgery, on-site critical care and anaesthesia.	Number of UK hospitals with 24/7 access to gastroscopy for AUGIB Proportion of UK hospitals with no provision for OOH endoscopic therapy for AUGIB Availability of a consultant-led service and the competence of on-call endoscopists at providing therapy at UGI endoscopy Availability of OOH endoscopy nurses Proportion of UK hospitals with on-site IR or access via an agreed referral pathway and proportion with no arrangements in place Number of UK hospitals with access to emergency surgery on site (for complicated UGI bleed) Availability of level 2 and 3 care

There is availability of both an on-call GI endoscopist proficient in endoscopic haemostasis and on-call support staff with technical expertise in the usage of endoscopic devices enables performance of endoscopy on a 24/7 basis.	Mean number of endoscopists on an OOH rota and proficient with therapeutic modalities Availability of trained nurses involved in OOH endoscopy in the use of therapeutic endoscopy equipment
Endoscopy lists are organised to ensure that AUGIB emergencies can be prioritised and all patients with AUGIB have their endoscopy within 24 hours. Units seeing more than 330 cases a year offer daily endoscopy lists. Units seeing fewer than 330 cases a year arrange their service according to local circumstances.	Number of UK hospitals with dedicated emergency slots for AUGIB with availability over the week and the weekend Estimated annual number of GI bleeding patients presenting to the hospital
Minimal monitoring during procedures for major AUGIB include blood pressure, pulse oximetry and ECG. Monitoring is provided by suitably skilled individuals who are separate from the procedural team and available 24/7.	Availability of blood pressure, pulse oximetry and ECG during emergency and out of hours endoscopy
There are a minimum of six interventional radiologists on an OOH rota.[35]	Mean number of interventional radiologists on an OOH rota where available
A massive transfusion protocol is available in all hospitals	Availability of guidelines on the management of major haemorrhage
Local arrangements are in place to provide compatible blood urgently for patients with major bleeding	Availability of on-call transfusion laboratory staff
Guidelines on GI bleeding are available in all hospitals	Availability of written guidelines on the management of AUGIB Availability of separate written guidelines on the management of VUGIB and NVUGIB

Audit Results

147 sites identified 5141 cases of AUGIB.

Table 1: Modes of presentation

	Patients (n = 5141) n (%)
New admission with evidence of AUGIB	3961 (77.1%)
AUGIB in an established inpatient	1044 (20.3%)
Transfer from another hospital for management of AUGIB	108 (2.1%)
Missing information	28 (0.5%)

The majority of cases (77.1%) were new admissions where evidence of AUGIB was identified upon arrival. A significant proportion (20.3%) of cases involved patients who developed AUGIB while already admitted as inpatients. Additionally, 108 (2.1%) cases were transferred from other hospitals specifically for the management of AUGIB. For a small fraction (0.5%) the mode of presentation was not recorded.

Table 2: Transfer Status

Transferred from	**Transferred patients (n = 108) n (%)**
Requiring transfer to another hospital	
From non-acute hospital	24 (22%)
From small District General Hospital	53 (49%)
From independent hospital	4 (4%)
Other	15 (14%)
Missing	12 (11%)

Out of 108 patients transferred, nearly half (49%) came from smaller district general hospitals, highlighting the role of larger, more specialised centres in managing complex cases of AUGIB. A smaller proportion (22%) were transferred from non-acute hospitals, and 4% from independent hospitals. Additionally, 14% of transfers were categorised under "Other," which may include scenarios such as transfers from other specialist units. For 11% the transfer data were missing, indicating some gaps in the data collection process.

Table 3: Patient Characteristics

	Patients (n = 5141) n (%)
Median age	69 years (IQR 54-80)
Gender	
Male	3014 (58.6%)
Female	2081 (40.5%)
Missing	46 (0.9%)
Ethnicity	
White	4471 (87%)
Mixed or multiple ethnic groups	32 (0.6%)
Asian or Asian British	237 (4.6%)
Black, African, Caribbean, or Black British	91 (1.8%)
Other ethnic groups	125 (2.4%)
Missing	185 (3.6%)
Comorbidities	
Any comorbidity	3427 (66.6%)
Ischaemic heart disease	926 (18%)
Cardiac failure	549 (10.7%)
Respiratory disease	759 (14.8%)
Stroke	401 (7.8%)
Dementia	240 (4.7%)
Underlying haematological condition	189 (3.7%)
Cancer/ malignancy	714 (13.9%)
Evidence of metastases	190 (3.7%)
Renal disease	656 (12.8%)
On renal replacement therapy	55 (1.1%)
Documented liver disease	972 (18.9%)
Alcohol-related cirrhosis	596 (11.6%)
Non-alcohol aetiology cirrhosis	184 (3.6%)
Chronic liver disease	115 (2.2%)
Acute alcoholic hepatitis	28 (0.5%)
Acute liver injury	7 (0.1%)
Other	179 (3.5%)

Medications	
NSAIDs	382 (7.4%)
Antiplatelets	1117 (21.7%)
Aspirin	790 (15.4%)
P2Y12 (clopidogrel/prasugrel/ ticagrelor) inhibitors	505 (9.8%)
Both	178 (3.5%)
Anticoagulants	1572 (30.6%)
Warfarin	160 (3.1%)
DOACs (apixaban/rivaroxaban/edoxaban/dabigatran)	934 (18.2%)
Low Molecular Weight Heparin or unfractionated	517 (10%)
heparin	336 (6.5%)
Both antiplatelets and anticoagulants	
Other	1540 (30%)
Alcohol use	
Haemodynamic Status*	
Normal	2679 (52.1%)
Haemodynamically unstable	2067 (40.2%)
Missing	395 (7.7%)
Hb at presentation	
≤ 70 g/l	1022 (19.9%)
Hb ≤ 80g/l	1613 (31.4%)
Missing	238 (4.6%)
Median Hb (IQR)	95 (74-123)

**On admission or first set of observations after developing AUGIB. Haemodynamic instability defined as HR≥100 and/or SBP<100mmHg*

This table shows that the median age of the patients was 69 years, with an IQR of 54 to 80 years, indicating predominantly older adults presenting with AUGIB in this audit. Gender distribution showed a higher prevalence in males, who accounted for 58.6% of cases, while females represented 40.5%, and 0.9% of cases had missing gender information. In terms of ethnicity, the majority of patients were identified as White (87%), with smaller percentages representing Asian or Asian British (4.6%), Black African Caribbean or Black British (1.8%), and other ethnic groups (2.4%). Ethnicity data was missing for 3.6% of the cases. The data highlights the significant burden of comorbidities among patients with AUGIB. Overall, 66.6% of patients had at least one comorbidity. The most common comorbid conditions i3ncluded ischaemic heart disease (18%), respiratory disease (14.8%), and documented liver disease (18.9%). A noteworthy portion of liver disease cases were due to alcohol-related cirrhosis (11.6%). Additionally, a variety of other conditions such as cancer/malignancy (13.9%), renal disease (12.8%), and stroke (7.8%) were also prevalent, emphasising the complexity and multifactorial nature of managing these patients.

Medication use at presentation further reflects the complexity of patient management. Notably, 30.6% of patients were on anticoagulants, including warfarin (3.1%) and DOACs (18.2%). Antiplatelet use was also significant, with 21.7% of patients on these medications, including aspirin (15.4%) and P2Y12 inhibitors (9.8%). The concurrent use of both antiplatelets and anticoagulants was observed in 6.5% of patients. NSAID use was reported in 7.4% of cases, and alcohol use was prevalent in 30% of the cohort, potentially contributing to the bleeding risk. Haemodynamic status on admission or at the first set of observations showed that 40.2% of patients were haemodynamically unstable, defined as having a heart rate (HR) ≥100 and/or systolic blood pressure (SBP) <100 mmHg, indicating a significant number of patients presented with severe bleeding. The median Hb level at presentation was 95 g/L (IQR 74-123), with 19.9% of patients having an Hb ≤ 70 g/L and 31.4% having an Hb ≤ 80 g/L.

Table 4: Symptoms at presentation

	Patients (n = 5141) n (%)
Fresh blood / Haematemesis	1575 (30.6%)
Haematochezia / Large volume bleeding PR	247 (4.8%)
Melaena	2935 (57.1%)
Coffee ground vomit	1045 (20.3%)
Shock / Syncope	359 (7%)
Other	605 (11.8%)

This table shows that the most common symptom was melaena, reported in 57.1% of cases, followed by fresh blood or haematemesis, which occurred in 30.6% of patients. Coffee ground vomit was reported in 20.3% of cases. Haematochezia, or large volume bleeding per rectum, was less common, occurring in 4.8% of patients. Shock or syncope, a marker of significant blood loss, was documented in 7% of cases, reflecting the acute and severe nature of some AUGIB presentations. Additionally, 11.8% of patients presented with other symptoms such as abdominal pains, drop in Hb, etc. which were captured as free text options.

Table 5: GBS categories (from raw data where available)

GBS Category	**Cases n (%)**	**Endoscopy performed n (%)**	**Re-bleeding in those undergoing endoscopy n (%)**	**Overall mortality n (%)**
Low risk (0-1)	342 (6.7%)	191 (55.8%)	3 (1.6%)	5 (1.5%)
Medium risk (2-6)	1098 (21.4%)	886 (80.7%)	40 (4.5%)	49 (4.5%)
High risk (7-11)	1715 (33.4%)	1528 (89.1%)	147 (9.6%)	120 (7%)
Very High risk (≥12)	1245 (24.2%)	1114 (89.5%)	172 (15.2%)	211 (16.9%)
Missing	741 (14.4%)	559 (75.4%)	52 (9.3%)	66 (8.9%)

This table summarises the distribution of patients according to their GBS, calculated from the raw data where available and the associated clinical outcomes, including the likelihood of undergoing endoscopy, rebleeding rates, and overall mortality. Patients were categorised into four risk groups based on their GBS. The Low-risk group (GBS 0-1) comprised 6.7% of cases, with 55.8% of these patients undergoing endoscopy. Rebleeding in this group was rare (1.6%), and the overall mortality rate was 1.5%. The Medium-risk group (GBS 2-6) represented 21.4% of cases, with 80.7% undergoing endoscopy. The rebleeding rate in this group was 4.5%, and the mortality rate was 4.5%. The High-risk group (GBS 7-11) made up 33.4% of cases, with a higher proportion (89.1%) undergoing endoscopy. The rebleeding rate was 9.6%, and the mortality rate was 7%, indicating a significant risk increase with higher GBS. The Very High-risk group (GBS ≥12) included 24.2% of patients, with 89.5% undergoing endoscopy. This group had the highest rebleeding rate at 15.2% and the highest mortality rate at 16.9%, reflecting the severe nature of their condition. Additionally, 14.4% of patients had missing data to calculate GBS. Of those with missing data, 75.4% underwent endoscopy, with a rebleeding rate of 9.3% and a mortality rate of 8.9%. The median GBS for all patients was 9 (IQR 5-12).

Table 6: Interventions and outcomes for AUGIB

	Patients (n = 5141) n (%)
Inpatient endoscopy (index endoscopy)	4279 (83.2%)
PUD	1309 (25.5%)
Variceal bleed	418 (8.1%)
Use of endoscopic therapy at index endoscopy	1159 (22.5%)
Further bleeding after index endoscopy	414 (8%)
Surgery	38 (0.7%)
Interventional Radiology	133 (2.6%)
Transfusion ≥1 unit	
RBC	2561 (49.8%)
Platelets	208 (4%)
FFP	280 (5.4%)
Median Length of stay	5 days (IQR 3-10)
Re-admitted within 28 days	205 (4%)
In-hospital mortality	451 (8.8%)
New admission	224/3961 (5.6%)
Established inpatients	212/1044 (20.3%)
Transferred from other hospitals	14/108 (13%)
Missing information on mode of presentation	1/28 (3.6%)

This table shows that most patients (83.2%) underwent inpatient endoscopy, with PUD being the most common finding, identified in 25.5% of cases. Variceal bleeding was noted in 8.1% of patients. Endoscopic therapy was required in 22.5% of cases, and 8% of patients experienced further bleeding after the initial endoscopy. Surgical intervention was necessary for 0.7% of patients, and IR

procedures were performed in 2.6% of cases. Blood transfusions were common, with 49.8% of patients receiving at least one unit of RBCs, while platelet and FFP transfusions were less frequently administered (4% and 5.4%, respectively). The median LOS was five days, with an IQR of 3 to 10 days. Re-admission within 28 days occurred in 4% of cases. The in-hospital mortality rate was 8.8%, with higher mortality among established inpatients (20.3%) compared to new admissions (5.6%).

ENDOSCOPY

4279/5141 (83%) patients had an inpatient endoscopy. For 2822/4277 (66%) patients, a cause was identified on endoscopy. 1159/4277 (27%) patients received endoscopic therapy and 325/4277 (8%) patients were intubated or received a general anaesthetic for the procedure.

Table 7: Reasons for no endoscopy

	Patients not undergoing IP OGD n =862 n (%)
An inpatient OGD was not indicated clinically	470 (54.5%)
Specifically categorised for no active treatment or investigations when they first presented with AUGIB	157 (18.2%)
Self-discharged before the OGD could be performed	62 (7.2%)
Transferred to another hospital for further management	9 (1%)
Died before the OGD could be performed	50 (5.8%)
Other	10 (1.2%)
Missing	104 (12.1%)

This table shows that the most common reason for not undergoing an inpatients endoscopy was that an inpatient OGD was not indicated clinically (54.5%). Additionally, 18.2% of patients were specifically categorised for no active treatment or investigations at the time of their presentation with AUGIB. Other reasons included patient self-discharge before the OGD could be performed (7.2%), transfer to another hospital for further management (1%), and patient death before the procedure could be conducted (5.8%). A small number of cases (1.2%) cited other reasons for not undergoing OGD, and in 12.1% of cases, the reason for not performing the OGD was not documented.

Table 8: Place of endoscopy for index endoscopy

	Patients undergoing IP OGD n= 4279 n (%)
Main endoscopy	3568 (83.4%)
Emergency theatres	355 (8.3%)
Designated GI bleeding unit	82 (1.9%)
Intensive Therapy Unit (ITU)	57 (1.3%)
Medical /Surgical ward	56 (1.3%)
Other	9 (0.2%)
Don't Know/Missing	152 (3.5%)

This table shows that the majority of endoscopies (83.4%) were conducted in the main endoscopy unit, reflecting the standard practice for performing these procedures in a controlled, specialised environment. A smaller proportion of procedures took place in emergency theatres (8.3%), which likely catered to patients requiring more urgent intervention. Other settings included designated GI bleeding units (1.9%), ITU (1.3%), and medical or surgical wards (1.3%), highlighting the adaptability of endoscopy services in different clinical scenarios. A minimal number of endoscopies were performed in other unspecified locations (0.2%), and in 3.5% of cases, the place of endoscopy was not documented.

Table 9: Endoscopic Diagnoses on index endoscopy

	Patients undergoing IP OGD n= 4279 n (%)
Any abnormality	2817 (65.8%)
Oesophagitis	694 (16.2%)
Ulcer	1309 (30.6%)*
Oesophageal	219 (5.1%)
Gastric	478 (11.2%)
Duodenal	711 (16.6%)
Mallory-Weiss tear	87 (2%)
Dieulafoy lesion	42 (1%)
Varices	418 (9.8%)*
Oesophageal	379 (8.9%)
Gastric	67 (1.6%)
Duodenal	8 (0.2%)
Portal hypertensive gastropathy	194 (4.5%)
Gastric antral vascular ectasia (GAVE)	86 (2%)
Telangiectasia	58 (1.6%)
Post-sphincterotomy bleed	12 (0.3%)
Malignancy	162 (3.8%)*
Oesophageal	70 (1.6%)
Gastric	73 (1.7%)
Duodenal	21 (0.5%)
Other	399 (9.3%)

**Total counts may not match as there were overlaps in diagnoses and locations.*

This table shows that the any abnormality was noted at index endoscopy in 65.8% of patients undergoing inpatient OGD. The most common diagnosis was PUD with 30.6% of patients having either oesophageal, gastric, or duodenal ulcers. Specifically, duodenal ulcers were the most frequent, accounting for 16.6% of cases, followed by gastric ulcers (11.2%) and oesophageal ulcers (5.1%). Oesophagitis was observed in 16.2% of patients, while variceal bleeding was diagnosed in 9.8% of cases, with oesophageal varices being the most prevalent (8.9%). Other notable findings included portal hypertensive gastropathy (4.5%), GAVE (2%), and Mallory-Weiss tears (2%). Less common diagnoses included Dieulafoy lesions (1%), telangiectasia (1.6%), post-sphincterotomy bleeding (0.3%), and malignancies, such as oesophageal (1.6%), gastric (1.7%), and duodenal cancers (0.5%). In 9.3% of cases, other miscellaneous findings were recorded.

Table 10: Comparative analysis on main outcomes with 2007 AUGIB audit

	2007 audit n=6750 n (%)	2022 audit n=5141 n (%)
Median age	68 yr (IQR 49-81)	69 yr (IQR 54-80)
Any (>=1) comorbidity	3389 (50%)	3427 (67%)
Medications at presentation		
NSAIDs	751 (11%)	382 (7.4%)
Antiplatelets	2233 (33%)	1117 (21.7%)
Anticoagulants	(889) 13%	1572 (30.6%)
Other		
Alcohol use*	1745 (26%)	1540 (30%)
CLD	599 (9%)	760 (15%)
Inpatient endoscopy	5004 (74%)	4279 (83%)
PUD	1826/5004 (36.5%)	1343/4279 (31.4%)
Varices	544/5004 (11%)	430/4279 (10%)
Use of endoscopic therapy	1172/5004 (23%)	1159/4279 (27.1%)
Further bleeding after index endoscopy	668/5004 (13.3%)	414/4279 (9.7%)
Surgery	127 (1.9%)	38 (0.7%)
IR	84 (1.2%)	133 (2.6%)
Transfusion ≥1 unit		
Packed RBCs	2922 (43%)	2561 (49.8%)
Platelets	189 (2.8%)	208 (4%)
FFP	503 (7%)	280 (5.4%)
Median LOS	5 days (IQR 2-12)	5 days (IQR 3-10)
In-hospital mortality	675 (10%)	451 (8.8%)
New admission	379/5547 (7%)	224/3961 (5.6%)
Established inpatients	288/1099 (26%)	212/1044 (20.3%)

** 2007 audit captured information on alcohol abuse defined as consumption/week of >21 units for males and >14 units for females*

The 2022 AUGIB audit shows significant changes in patient characteristics, clinical management, and outcomes compared to the 2007 audit. The median age of patients increased slightly from 68 to 69 years, and the proportion with at least one comorbidity rose from 50% to 67%, suggesting a more complex patient profile. Notably, there was a shift in medication use: NSAID use decreased from 11% to 7.4%, antiplatelet use dropped from 33% to 21.7%, while anticoagulant use more than doubled (13% to 30.6%). Percentage of patients with underlying liver disease also increased, from 9% to 15%, indicating a higher proportion of patients at risk for variceal bleeding. Endoscopic management showed notable improvements, with inpatient endoscopy rates increasing from 74% to 83%.

The proportion of PUD cases decreased in 2022 (31.4% vs. 36.5% in 2007), while varices remained steady at around 10% in 2022 compared to 11% in 2007, despite the rise in patients with underlying liver disease. Endoscopic therapy usage increased from 23% to 27.1%, and rates of further bleeding after index endoscopy improved, dropping from 13.3% in 2007 to 9.7% in 2022. The need for surgery decreased substantially from 1.9% to 0.7%, with a concurrent rise in IR use from 1.2% to 2.6%, reflecting a growing reliance on non-surgical interventions as a key alternative.

In terms of transfusion practices, the percentage of patients receiving packed RBCs increased from 43% to 49.8%, while platelet transfusions rose from 2.8% to 4%, and FFP use decreased from 7% to 5.4%. Median hospital stay remained steady at 5 days, though the IQR narrowed. Overall in-hospital mortality declined from 10% to 8.8%, with a reduction in mortality among new admissions (from 7% to 5.6%), although mortality for established inpatients remains high at 20.3%, down from 26% in 2007. These findings underscore the progress in AUGIB management, particularly in endoscopic and non-surgical interventions, while also highlighting the continued need for tailored strategies to address the complex needs of high-risk patients.

Performance against Audit Standards

Standard : Use of care bundle

Patients with suspected or overt acute upper gastrointestinal bleeding (AUGIB) in the absence of an alternate diagnosis (e.g., bowel obstruction) trigger the AUGIB bundle [10].

Specific measure: *Use and documentation of British Society of Gastroenterology (BSG)-led multi-society consensus care bundle in clinical notes.*

Table 11: Completion of AUGIB care bundle in the first 24 hours of presentation

	n = 5141 n (%)
Yes	891 (17.3%)
No	2383 (46.4%)
Unclear documentation	1777 (34.6%)
Missing	90 (1.7%)

This table shows that use and documentation of BSG-led multi-society consensus AUGIB care bundle in clinical notes has been suggested within the first 24 hours of presentation.[10] The care bundle, which includes key management steps aimed at improving patient outcomes, was completed only in 17.3% of cases. This highlights a gap in the consistent application of the care bundle during the initial critical period. In 46.4% of cases, the care bundle was not completed, which may indicate variations in practice or challenges in adhering to the recommended guidelines. Additionally, in 34.6% of cases, documentation was unclear, suggesting potential issues with record-keeping or communication within the clinical teams. The care bundle status was missing in 1.7% of cases, reflecting incomplete data capture.

Standard : Risk assessment

Formal risk assessment scores are used for all patients with AUGIB; Patients with suspected AUGIB have urgent observations performed using a validated early warning score such as the National Early Warning Score (NEWS); There is consideration of early discharge for low-risk patients.

Specific measures: *Use and documentation of Glasgow-Blatchford score (GBS) at presentation; Use and documentation of validated early warning scores; Percentage of low-risk patients (GBS ≤1) admitted vs. discharged for out-patient management.*

Table 12: Pre-endoscopy risk score calculation

	n = 5141 n (%)
Yes	2974 (57.8%)
No	2092 (40.7%)
Missing	75 (1.5%)

This table outlines the use of pre-endoscopy risk scores, such as the GBS, in patients presenting with AUGIB. Risk scores are helpful in assessing the severity of the bleed and guiding clinical management decisions. The data show that 57.8% of patients had a risk score calculated. Among those for whom a score was calculated, the Glasgow-Blatchford Score was the most commonly used, calculated in 95.7% of cases, followed by the Rockall score, which was used in 9.6% of cases. Some patients had more than one risk score calculated (187/2974, 6.3%), and a small number (5/2974) had a risk score other than GBS or Rockall. (Table 13).

However, in 2092 (40.7%) patients no pre-endoscopy risk score was recorded, which may reflect either a deviation from recommended practice or potential barriers to completing the risk assessment in certain clinical settings. In 1.5% of cases, the data on whether a risk score was calculated were missing. These findings suggest that while pre-endoscopy risk assessment is frequently performed, there is room for improvement in ensuring that all patients with AUGIB undergo appropriate risk stratification to guide clinical decision making in striving to improve outcomes.

Table 13: Risk score calculated

	n = 2974 n (%)
Glasgow-Blatchford score	2846 (95.7%)
Pre-endoscopy Rockall score	287 (9.6%)
Other	5 (0.2%)

187 patients had more than one risk score calculated

Table 14: Documentation of observations for validated early warning scores such as NEWS

	n = 5141 n (%)
Temperature	
Median (IQR)	36.5 Degree Celsius (36.2 -36.9 Degree Celsius)
Missing	585 (11.4%)
Heart rate	
Median (IQR)	90 BPM (78 – 105)
Missing	415 (8.7%)
Systolic BP	
Median (IQR)	122 mm of Hg (106-138)
Missing	412 (8%)
Diastolic BP	
Median (IQR)	70 mm of Hg (60-81)
Missing	442 (8.6%)
Respiratory rate	
Median (IQR)	18 per min (17-20)
Missing	535 (10.4%)
Oxygen saturation	
Median (IQR)	98% (96-99)
Missing	491 (9.5%)
Level of consciousness	
Alert	3938 (76.6%)
Confusion (new)	126 (2.4%)
Voice	35 (0.7%)
Pain	11 (0.2%)
Unresponsive	26 (0.5%)
Missing	1005 (19.5%)
All observations missing (inconsistency in data capture)	328 (6.4%)

This table summarises the extent to which key clinical observations were documented for patients presenting with AUGIB. These observations are critical components of validated early warning scores like NEWS, which are used to assess the severity of a patient's condition. Notably, 6.4% of patients had all observations missing, indicating gaps in data capture. This table highlights the overall high level of documentation for key observations, though it also points to areas where data collection could be improved, particularly in ensuring that all relevant clinical observations are consistently recorded to support effective patient management.

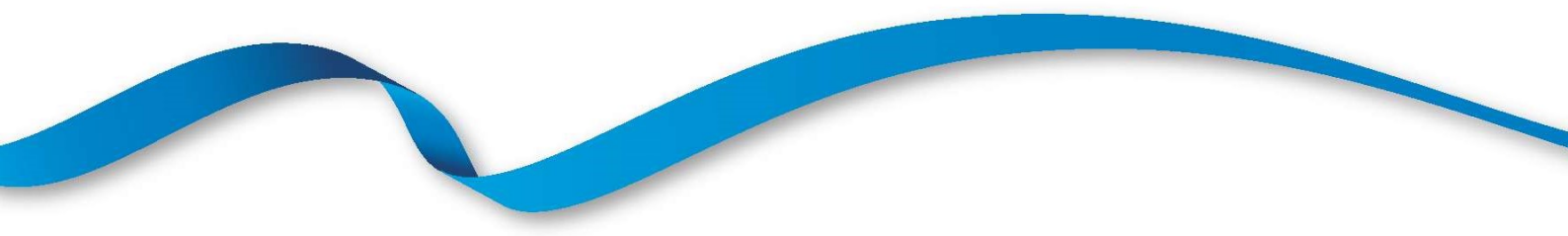

Table 15: Percentage of low-risk patients admitted vs discharged for out-patient management

GBS score ≤1	**n=342 n (%)**
Admitted for inpatient endoscopy	191 (55.8%)
Discharged with plan for outpatient endoscopy	76 (22.2%)
No plan for OGD	57 (16.7%)
Missing information	18 (5.3%)

This table summarises the management decisions for patients identified as low risk (GBS ≤1) based on the GBS score, calculated using raw data. Out of the total 342 low-risk patients, 55.8% were admitted for inpatient endoscopy, indicating a conservative approach to patient management despite their low-risk status. Conversely, 22.2% of low-risk patients were discharged with a plan for outpatient endoscopy, reflecting a more selective strategy in managing patients deemed less likely to experience severe outcomes. Additionally, 16.7% of low-risk patients had no plan for OGD, which may suggest a decision to avoid further invasive procedures given their low risk profile. Missing information was reported in 5.3% of cases.

The table illustrates the variability in clinical decision-making for low-risk patients, with a notable proportion still being admitted for inpatient management despite their lower risk of adverse events.

Standard : Resuscitation and initial management

All patients with AUGIB are commenced on intravenous (IV) fluids; Patients with AUGIB with ongoing haemodynamic instability are referred for critical care review; Patients with cirrhosis receive vasoactive drugs e.g. terlipressin (or octreotide, if contraindicated) and antibiotics; Patients with AUGIB are not given tranexamic acid; Red blood cell transfusion follows a restrictive protocol (trigger: Hb <70 g/L; target: 70–100 g/L). [10] Transfusion policy in individual patients includes the consideration of other factors such as cardiovascular disorders, or ongoing bleeding with haemodynamic instability; Platelets are given in active AUGIB with a platelet count ≤$50x10^9$/L, as per major haemorrhage protocols; Fresh frozen plasma (FFP) is offered to patients who are actively bleeding (non-variceal) and have a prothrombin time (or international normalised ratio) or activated partial thromboplastin time greater than 1.5 times normal[30]; When a patient's fibrinogen level remains less than 1 g/litre despite fresh frozen plasma use, offer cryoprecipitate as well [30]; In the setting of suspected or known variceal bleeding, transfusion of FFP is not supported (as it may lead to volume overload and worsening portal hypertension without correction of the underlying coagulopathy) [29,31].

Specific measures: *Pre-endoscopic use of IV fluids for all (admitted) cases of AUGIB; Use of tranexamic acid in patients with AUGIB; Use of antibiotics as per local policy in all patients with cirrhosis and AUGIB; and terlipressin (or octreotide if contraindicated) started as soon as variceal bleeding suspected; Number of red blood cell, platelets, FFP, PCC and cryoprecipitate transfusions per patient; Threshold and target Hb, platelets and clotting parameters; Frequency of inappropriate or unnecessary use of red blood cells, platelets, FFP and cryoprecipitate; Number and percentage of patients that trigger a massive haemorrhage alert.*

Table 16: Pre-endoscopic management

	n = 5141 **n (%)**
Referral to critical care	541 (10.5%)
Admission to critical care	297 (5.8%)
Level II/HDU	97 (1.9%)
Level III/ITU	199 (3.9%)
MHP activated	251 (4.9%)

HDU: High-dependency unit; ITU: Intensive therapy unit; MHP: Major haemorrhage protocol

This table highlights the steps taken to stabilise patients and prepare them for further diagnostic or therapeutic procedures. A significant portion of patients (10.5%) were referred to critical care units, reflecting the severity of their condition upon presentation. Of these, 5.8% were admitted to critical care, with 1.9% requiring Level II/HDU care and 3.9% needing Level III/ITU care. The MHP was activated in 4.9% of cases.

Table 17: Resuscitation in the first 24 hours/ pre-endoscopy for AUGIB presentation

	n = 5141 n (%)
IV fluid (crystalloid)	3497 (68%)
IV fluid (colloid)	41 (0.8%)
RBC	1938 (37.7%)
FFP	194 (3.8%)
Platelets	109 (2.1%)
Human Albumin Solution	64 (1.2%)
Other	82 (1.6%)
None of the above	812 (15.8%)

This table summarises the resuscitation efforts provided to patients within the first 24 hours of presenting with AUGIB, prior to undergoing endoscopy. The table reflects the varied approaches to stabilising patients during this critical period. Most patients (68%) received IV crystalloid fluids, a standard practice for volume resuscitation in acute bleeding scenarios. The mean volume of crystalloids administered was 941 ml (Standard Deviation 420 ml). IV colloid fluids were administered to a much smaller proportion of patients (0.8%) with a mean volume of 641 ml (Standard Deviation 435 ml). RBC transfusions were common, provided to 37.7% of patients, indicating suspected significant blood loss in a large subset of the population, with a median of 2 units (IQR 1-3). FFP was administered to 3.8% of patients, and platelet transfusions were given to 2.1%, reflecting their use in cases with coagulopathy or significant bleeding. Human Albumin Solution, used less frequently, was administered to 1.2% of patients. A small percentage of patients (1.6%) received other forms of resuscitation, while 15.8% did not receive any of the listed resuscitative measures, which could indicate a milder presentation or alternative clinical management strategies.

Table 18: Other products in the first 24 hours/ pre-endoscopy for AUGIB presentation

	n = 5141 n (%)
Vitamin K	602 (11.7%)
Cryoprecipitate	42 (0.8%)
Fibrinogen concentrate	8 (0.2%)
PCC	121 (2.3%)
Recombinant factor VIIa	3 (0.1%)
TXA	312 (6.1%)
Other	95 (1.8%)
None of the above	3869 (75.3%)

This Table summarises the administration of additional blood products and medications to patients with AUGIB before undergoing endoscopy. These interventions can be important in managing coagulopathy and stabilising patients prior to definitive treatment. Vitamin K was administered to

11.7% of patients, which is typically used to reverse anticoagulation or in those with elevated INR levels. Cryoprecipitate, which is rich in fibrinogen, was given to 0.8% of patients, reflecting its use in managing significant coagulopathies. Fibrinogen concentrate was administered in 0.2% of cases, likely in situations where fibrinogen levels were critically low despite other interventions. PCC, used for rapid reversal of warfarin and other anticoagulants, was given to 2.3% of patients. Recombinant factor VIIa, a more targeted therapy for severe bleeding, was administered in 0.1% of cases. TXA, an antifibrinolytic agent, was used in 6.1% of patients, despite guidelines advising caution due to lack of evidence of its benefit in acute GI bleeding. Other interventions were noted in 1.8% of cases, while 75.3% of patients did not receive any of the listed additional products or medications.

Table 19: Pre-endoscopy management of patients with underlying CLD

	n=816 n (%)
Antibiotics	358 (43.9%)
Terlipressin	397 (48.7%)
Octreotide	4 (0.5%)

This table summarises the specific interventions provided to patients with AUGIB who also had CLD. Managing these patients requires particular attention due to the increased risk of variceal bleeding and complications associated with liver dysfunction. Antibiotics were administered to 43.9% of these patients, where infections can exacerbate bleeding and lead to higher mortality. Terlipressin, a vasopressor used to control portal hypertension in patients with variceal bleeding, was given to 48.7% of patients. Octreotide, an alternative therapy to terlipressin, was used in 0.5% of cases, possibly because terlipressin was contraindicated or unavailable. However, the use of antibiotics and vasopressors should be closer to 100% in patients with liver disease, particularly when variceal bleeding is suspected. BASL and BSG developed a care bundle to enhance the management of CLD during the first 24 hours of hospital admission.[36] Although a UK-wide audit showed the bundle improves care quality, its use remains limited, highlighting the need to explore barriers to implementation and optimise inpatient care for CLD patients. The audit reveals a significant gap in the use of these interventions, indicating an area where clinical practice could be improved to align more closely with established guidelines.[37,38] Ensuring that all patients with suspected variceal bleeding receive appropriate antibiotic prophylaxis and vasopressor therapy is essential to improve outcomes in this high-risk group.

TRANSFUSION MANAGEMENT

Red Blood Cell Transfusion

Overall, 2561 (49.8%) of patients received an RBC transfusion during their hospital admission for AUGIB. 1938 out of 2561 (75.7%), received their transfusion within the first 24 hours of presentation.

Table 20: Use of RBC transfusions for patients with AUGIB based on their pre-transfusion haemoglobin (Hb) levels during the first 24 hours (early RBC) of their presentation.

Pre-transfusion Hb	Total patients receiving early RBC transfusion at this threshold (n=1938) n	Haemodynamically unstable* n (%)	Haemodynamically stable n (%)	Missing data n (%)
Hb ≤ 70	975	441 (45.2%)	477 (48.9%)	57 (5.9%)
Hb 71-80	453	192 (42.4%)	233 (51.4%)	28 (6.2%)
Hb 81-90	216	121 (56%)	83 (38.4%)	12 (5.6%)
Hb 91-100	78	42 (53.8%)	28 (35.9%)	8 (10.3%)
Hb 101-110	39	26 (66.7%)	11 (28.2%)	2 (5.1%)
Hb 111-120	27	16 (59.3%)	10 (37%)	1 (3.7%)
Hb ≥ 121	20	16 (80%)	3 (15%)	1 (5%)
No Hb Value	130	57 (43.8%)	54 (41.5%)	19 (14.6%)

** Haemodynamically unstable: HR >100 and/or SBP<100*

The table highlights the use of early RBC transfusions for patients with AUGIB based on their pre-transfusion Hb levels during the first 24 hours of care. A significant proportion of patients, particularly those with Hb ≤ 70 g/L, received early RBC transfusions, with 45.2% of these patients being hemodynamically unstable and 48.9% being haemodynamically stable, both in line with clinical need. However, transfusions were also administered to patients with higher Hb levels (from 71-80 even up to >121 g/L) in haemodynamically stable patients, although clinical guidelines recommend a more restrictive approach for the use of RBC unless major haemorrhage or ACS is present. These findings suggest that more careful clinical consideration is warranted before administering RBC transfusions. Overuse of transfusions in stable patients or those without clear indications exposes them to unnecessary risks.

We captured information on the use of transfusions over 24-hour episodes throughout the course of a patient's in-hospital stay with each 24-hour period defined as an episode of transfusion. Table 21 presents data related to early RBC transfusion, i.e., transfusions given in the first 24 hours or during the first episode. To further understand transfusion practices across the entire hospital stay, we examined adherence to the current recommendation of using restrictive RBC transfusion thresholds (≤70 g/L) for patients who require transfusion and do not have major haemorrhage ?say active bleeding instead or ACS (Table 21). This broader assessment will provide additional insight into how well transfusion practices align with established guidelines over time.

Standard : Restrictive red blood cell transfusion thresholds (≤70 g/litre) are used for patients who need red blood cell transfusions and who do not have major haemorrhage or acute coronary syndrome (NICE 2015).[39]

Table 21: The adherence to the recommended restrictive transfusion threshold in transfused patients with AUGIB.

	Patients who received a red cell transfusion n= 2561
Patients meeting criteria for restrictive transfusion threshold:*	2243 (87.6%)
All transfusions were at ≤ 70g/l	828 (36.9%)
At least one transfusion was at > 70g/l	1278 (57%)
All transfusions were at ≤ 80g/l	1603 (71.5%)
At least one transfusion was at > 80g/l	503 (22.4%)
Missing Hb values	137 (6.1%)
N (%) meeting Standard	828 (36.9%)

** Defined as patients that do not have major haemorrhage (triggering MHP) or acute coronary syndrome*

The recommended threshold for a restrictive transfusion strategy is set at ≤70 g/L; however, the data indicates that clinical practice often deviated from this guideline. Among the national cohort, only 36.9% of patients received all transfusions at or below the ≤70 g/L threshold, which suggests that strict adherence to the restrictive strategy was not the norm, indicating that many clinicians opted for a higher Hb threshold, possibly due to concerns about patient stability such as the risk of further bleeding or because a more conservative approach to managing bleeding was favoured even though it was outside guidelines. This deviation from the recommended practice suggests that there is a significant gap between guidelines and clinical practice, underscoring the need for increased education and feedback to clinicians about their use of RBC transfusion to align blood transfusion practice more closely with guidelines.

Table 22: Transfusion episodes meeting the criteria for restrictive transfusion

	n=4094
Episodes meeting criteria for restrictive transfusion threshold	3518 (85.9%)
Number transfused at ≤ 70g/l	1665 (47.3%)
Number transfused at > 70g/l	1620 (46.1%)
Number transfused at ≤ 80g/l	2706 (66.1%)
Number transfused at > 80g/l	579 (16.5%)
Missing Hb value	233 (6.6%)
n (%) meeting Standard	1665 (47.3%)

This table summarises the adherence to the restrictive transfusion strategy across 4,094 red cell transfusion episodes within the national cohort. An episode is defined as a 24-hour period during which transfusion was given. Of these episodes, 85.9% were eligible for a restrictive transfusion strategy, as they excluded patients with major haemorrhage or acute coronary syndrome.

Among these eligible episodes, 47.3% met the restrictive transfusion threshold of Hb ≤ 70 g/L. In contrast, 46.1% involved transfusions at Hb levels above 70 g/L. When considering a slightly higher threshold, 66.1% of transfusions occurred at Hb levels of ≤ 80 g/L, while 16.5% were administered at Hb levels above 80 g/L. Notably, 6.6% had missing Hb values, which could impact the overall assessment of adherence to the restrictive strategy. These data highlight variability in transfusion practices, with nearly half of transfusion episodes exceeding the guidelines for restrictive RBC transfusion.

Standard : A haemoglobin concentration target of 70–90 g/litre after transfusion is used for patients who need red blood cell transfusions and who do not have major haemorrhage or acute coronary syndrome (NICE 2015).[39]

Table 23: Adherence to the recommended Hb target of 70-90 g/L after RBC transfusion in stable patients with AUGIB

	n=2561 n (%)
Patients meeting criteria for restrictive transfusion threshold	2243 (87.6%)
Median number of units patients received (IQR)	2 (1-3)
At least one transfusion had a post-transfusion Hb < 70g/l	244 (10.9%)
All transfusions had post-transfusion Hb 70-90g/l	1024 (45.7%)
At least one transfusion had a post-transfusion Hb > 90g/l	828 (36.9%)
At least one transfusion had a post-transfusion Hb>100g/l	322 (14.4%)
Missing post-transfusion Hb values	199 (8.9%)
N (%) meeting Standard	1024 (45.7%)

This table summarises the adherence to the NICE 2015 guideline, which recommends maintaining a Hb target of 70–90 g/L after transfusion for patients who require RBC transfusions and do not have major haemorrhage or ACS. In this national cohort of 2,561 patients who received red cell transfusions, 87.6% of patients were eligible for a restrictive transfusion strategy. The median number of units transfused per patient was 2, with an IQR of 1 to 3 units. Among these patients, 10.9% of patients had at least one transfusion resulting in a post-transfusion haemoglobin level below 70 g/L, indicating further transfusion is needed. 45.7% of patients had post –transfusion Hbs for all transfusions within the target range of 70-90 g/L. However, 36.9% of patients had at least one transfusion with a post-transfusion Hb exceeding 90 g/L, and 14.4% of patients exceeded 100 g/L. Overall, 45.7% of the patients fully met the guideline standard, highlighting variability in achieving the recommended post-transfusion Hb targets.

Platelet Transfusion

208 (4%) patients received a platelet transfusion during their hospital presentation for AUGIB. The majority, 109 out of 208 (52.4%), received their transfusion within the first 24 hours of presentation. There were 283 episodes of platelet transfusions across these 208 patients with each episode representing platelet transfusions administered over a 24-hour period. Further details regarding platelet transfusion management are outlined in the Tables 24 and 25 below, providing more specific insights into transfusion practices over time.

Standard : Platelets are given in active AUGIB with a platelet count ≤50x10^9/L, as per major haemorrhage protocols.[10]

Table 24: Aspects of platelet transfusion in patients who received platelet transfusions

	n=208
Patients that received at least one platelet transfusion	208
Median no. of adult doses of platelets transfused per patient	1 (IQR 1-2)
Total episodes of platelets transfusion for patients transfused	*283*
Median no. of adult doses of platelets transfused per episode	1 (IQR 1-1)
Indications for different episodes of platelets transfusion - Massive haemorrhage - Platelet count <= 50 pre-procedure - Other / Missing information	 195 84 4

The median number of adult doses of platelets transfused per patient was 1, with an IQR of 1 to 2 doses. Across these patients, there were 283 episodes of platelet transfusion, with a median of 1 dose per episode (IQR 1-1). The primary indications for these transfusions included massive haemorrhage, accounting for 195 episodes, and a pre-procedure platelet count of ≤ 50 x 10^9/L, accounting for 84 episodes. A small number of episodes (4) had other or missing information regarding the indication for transfusion.

Table 25: Pre-transfusion platelet counts in patients receiving platelet transfusion in the first 24 hours of presentation

Platelets count at presentation	Total patients receiving platelets transfusion at this threshold (n=109) n	Clinically significant bleeding* n (%)	Not meeting criteria for clinically significant bleeding* n (%)	Missing Data to label as clinically significant bleeding* n (%)
Platelets ≤ 50	59	33 (55.9%)	24 (40.7%)	2 (3.4%)
Platelets 51-100	15	8 (53.3%)	5 (33.3%)	2 (13.3%)
Platelets >100	20	13 (65%)	7 (35%)	0 (0.0%)
No Platelets Value	15	8 (53.3%)	5 (33.3%)	2 (13.3%)

**Clinically significant bleeding - defined as bleeding associated with a systolic blood pressure <100mmHg, heart rate ≥ 100 and ≥1-unit red cell transfusion*

For patients with platelet counts ≤ 50 x 10^9/L, 55.9% met the criteria for clinically significant bleeding, consistent with guidelines recommending platelet transfusions in this setting. However, 40.7% of transfused patients with platelet counts ≤50 x 10^9/L did not meet the criteria for significant bleeding indicating overuse of platelet transfusions. In patients with platelet counts between 51-100 x 10^9/L, 53.3% of patients met the criteria for significant bleeding, while 33.3% did not, both reflecting inappropriate use of platelet transfusion. In patients with platelet counts > 100 x 10^9/L, only 65% of patients met the criteria for significant bleeding. The presence of missing platelet values in 15 patients, 53.3% of whom met the criteria for significant bleeding, limits the assessment of overall guideline adherence in these cases.

FFP transfusion

A total of 280 patients (5.4%) received FFP in the national cohort, with 163 of these cases occurring as part of the MHP. The remaining 117 patients (2.3%) received FFP outside the MHP and were eligible for assessment against the audit standards.

Standard : FFP is offered to patients who are actively bleeding (non-variceal) and have a prothrombin time (or international normalised ratio (INR)) or activated partial thromboplastin time greater than 1.5 times normal. [30]

Table 26: FFP Transfusion

	n=5141 n (%)
Patients receiving FFP outside major haemorrhage protocol	117 (2.3%)
INR > 1.5 times normal and received FFP	49 (41.9%)
INR > 1.5 times normal with clinically significant bleeding and received FFP	31 (26.5%)
INR > 1.5 times normal with clinically significant non-variceal bleeding and received FFP	13 (11.1%)
N (%) meeting standard	13/117 (11.1%)

49 patients had an INR > 1.5 times normal, and 31 patients had both an INR > 1.5 and clinically significant bleeding, as defined by systolic blood pressure < 100 mmHg, heart rate ≥ 100, and ≥1-unit RBC transfusion. However, only 13 patients (11.1%) met the standard for appropriate FFP use, with clinically significant non-variceal bleeding and an INR > 1.5 times normal. These findings highlight the need for stricter adherence to guidelines, as the majority of FFP transfusions outside the MHP did not meet the standard for appropriate use.

Cryoprecipitate transfusion

Among 5141 patients, 70 (1.4%) received cryoprecipitate, with 35 (0.7%) given outside the MHP.

Standard : Cryoprecipitate transfusion is considered for patients without major haemorrhage who have clinically significant bleeding and a fibrinogen level below 1.5 g/Litre. If a patient's fibrinogen level remains less than 1 g/Litre despite fresh frozen plasma use, cryoprecipitate is offered in addition.

Table 27: Cryoprecipitate Transfusion

	n= 5141 n (%)
Patients who received Cryoprecipitate	70 (1.4%)
Patients who received Cryoprecipitate outside major haemorrhage protocol	35 (0.7%)
Appropriate use of cryoprecipitate	
- Fibrinogen ≤1.5 g/L with clinically significant bleeding*	9/35 (12.8%)
- Fibrinogen ≤1 g/L after receiving FFP	6/35 (8.6%)
N (%) meeting Standard for appropriate use	15/35 (42.8%)

**Clinically significant bleeding - defined as bleeding associated with a systolic blood pressure <100mmHg, heart rate ≥ 100 and ≥1 unit red cell transfusion*

12.8% of patients had fibrinogen ≤ 1.5 g/L with clinically significant bleeding, and 8.6% had fibrinogen ≤ 1 g/L after receiving FFP, meeting appropriate use criteria. Overall, 42.8% of cryoprecipitate transfusions outside the MHP adhered to guidelines, highlighting the need to improve compliance in its use.

Standard : Use and impact of concurrent medications

Continue aspirin at presentation; Interrupt P2Y12 inhibitors (Clopidogrel, Prasugrel or Ticagrelor) until haemostasis is achieved; Interrupt warfarin therapy at presentation; Offer prothrombin complex concentrate (PCC) to patients who are taking warfarin; Interrupt direct oral anticoagulant (DOAC) therapy at presentation; Use of a DOAC reversal agent or intravenous PCC is considered in patients with severe ongoing bleeding.

Specific measures: *Prevalence of antiplatelet use, number/proportion of patients with antiplatelets withheld at time of presentation with AUGIB, effect of antiplatelet use on severity of bleeding and outcomes; Prevalence of anticoagulant and DOAC use, number/proportion of patients with anticoagulants and DOACs withheld at time of presentation with AUGIB, effect of anticoagulant and DOAC use on severity of bleeding and outcomes; Methods of anticoagulant reversal.*

Table 28: Concurrent medications at the time of presentation

	n=5141 n (%)	**Discontinued at presentation n (%)**
Aspirin	790 (15.4%)	588 (74.4%)
P2Y12 inhibitors (Clopidogrel, Prasugrel or Ticagrelor)	505 (9.8%)	429 (84.9%)
Warfarin	160 (3.1%)	144 (90%)
DOACs (Apixaban, Rivaroxaban, Edoxaban, Dabigatran)	935 (18.2%)	876 (93.7%)
Heparin	517 (10.1%)	397 (76.8%)
Prophylaxis	403	310 (76.9%)
Therapeutic dose	95	76 (80%)
Bridging therapy	11	7 (63.6%)
Missing	11	5 (45.4%)
NSAIDs	382 (7.4%)	349 (91.3%)

This table outlines medication use among patients at the time of AUGIB presentation and the extent of discontinuation to mitigate bleeding risks. Among the 790 patients on aspirin (median age 75 years, IQR 66-82), 74.4% had the medication discontinued upon presentation. Similarly, for 505 patients on P2Y12 inhibitors (e.g., clopidogrel, prasugrel, ticagrelor; median age 75 years, IQR 67-82), 84.9% had the drugs stopped. Of the 160 patients on warfarin (median age 78 years, IQR 68-85), 90% discontinued its use. Among 935 patients on direct oral anticoagulants (DOACs) such as apixaban, rivaroxaban, edoxaban, or dabigatran (median age 80.5 years, IQR 74-86), 93.7% discontinued these medications. For 517 patients on heparin (median age 73 years, IQR 60-83), discontinuation rates varied by usage: 76.9% for those on prophylactic doses, 80% for those on therapeutic doses, 63.6% for those on bridging therapy, but 45.4% of patients with missing dose information had their heparin stopped. Additionally, 91.3% of patients taking NSAIDs (median age 63 years, IQR 50-75) had these drugs discontinued. The high rates of medication discontinuation

highlight the clinical focus on managing bleeding risks in patients presenting with AUGIB, particularly among those on anticoagulants and antiplatelet agents.

Table 29: Management of patients on Aspirin

	n=790 **n (%)**
Discontinued at time of presentation	588 (74.4%)
Underwent endoscopy	517 (65.4%)
Cause of bleed found	321 (40.6%)
Required endotherapy	151 (19.1%)
Further bleeding	52 (6.6%)
Re-started post-endoscopy	233 (29.5%)
Continued at time of presentation	184 (23.3%)
Underwent endoscopy	151 (19.1%)
Cause of bleed found	90 (11.4%)
Required endotherapy	38 (4.8%)
Further bleeding	15 (1.9%)
Information not available	18 (2.3%)

This table summarises the outcomes and management decisions for the 790 patients in the national cohort who were on aspirin at the time of presentation with AUGIB. Of these, 74.4% of patients had aspirin discontinued upon presentation. Among those who discontinued aspirin, 65.4% of patients underwent endoscopy, with 40.6% of patients having a cause of bleeding identified, 19.1% requiring endotherapy, and 6.6% experiencing further bleeding. Post-endoscopy, aspirin was restarted in 29.5% of patients. In contrast, 23.3% of patients continued aspirin at the time of presentation. Of these, 19.1% underwent endoscopy, with 11.4% having a cause of bleeding found, 4.8% requiring endotherapy, and 1.9% experiencing further bleeding. Information was not available for 2.3% of patients.

Table 30: Management of patients on P2Y12 inhibitors (Clopidogrel, Prasugrel or Ticagrelor)

	n=505 n (%)
Discontinued at time of presentation	429 (85%)
Underwent endoscopy	370 (73.3%)
Cause of bleed found	215 (42.6%)
Required endotherapy	88 (17.4%)
Further bleeding	31 (6.1%)
Re-started post-endoscopy	190 (37.6%)
Continued at time of presentation	74 (14.7%)
Underwent endoscopy	58 (11.5%)
Cause of bleed found	34 (6.4%)
Required endotherapy	8 (1.6%)
Further bleeding	4 (0.8%)
Information not available	2 (0.4%)

This table summarises the outcomes and management strategies for the 505 patients in the national cohort who were on P2Y12 inhibitors at the time of presentation with AUGIB. Of these, 85% of patients had their P2Y12 inhibitors discontinued upon presentation. Among these patients, 73.3% underwent endoscopy, with a cause of bleeding identified in 42.6%, 17.4% requiring endotherapy, and 6.1% experiencing further bleeding. Post-endoscopy, the P2Y12 inhibitors were restarted in 37.6% of patients. In contrast, 14.7% of patients continued their P2Y12 inhibitors at the time of presentation, with 11.5% undergoing endoscopy, a cause of bleeding found in 6.4%, 1.6% requiring endotherapy, and 0.8% experiencing further bleeding. Information was not available for 0.4% patients.

Table 31: Management of patients on Warfarin

	n=160 n (%)
Discontinued at time of presentation	144 (90%)
Underwent endoscopy	129 (80.6%)
Cause of bleed found	76 (47.5%)
Required endotherapy	26 (16.2%)
Further bleeding	11 (6.9%)
Re-started post-endoscopy	66 (41.2%)
Continued at time of presentation	13 (8.1%)
Underwent endoscopy	12 (7.5%)
Cause of bleed found	7 (4.4%)
Further bleeding	0 (0%)
Required endotherapy	2 (1.2%)
Information not available	3 (1.9%)

This table summarises the outcomes and management strategies for the 160 patients in the national cohort who were on warfarin at the time of presentation with AUGIB. Of these, 90% had warfarin discontinued upon presentation. Among those who discontinued warfarin, 80.6% underwent endoscopy, with a cause of bleeding identified in 47.5% patients, 16.2% requiring endotherapy, and 6.9% experiencing further bleeding. Warfarin was restarted post-endoscopy in 41.2% patients. In contrast, 8.1% of patients continued warfarin at the time of presentation, with 7.5% undergoing endoscopy, 4.4% having a cause of bleeding found, 1.2) requiring endotherapy, and none experiencing further bleeding. Information was not available for 1.9% of patients. Additionally, PCC was administered to 22.5% of patients and vitamin K to 61.2% of patients who were taking warfarin.

Table 32: Management of patients on DOACs (Apixaban, Rivaroxaban, Edoxaban, Dabigatran)

	n=935 n (%)
Discontinued at time of presentation	876 (93.7%)
Underwent endoscopy	763 (81.6%)
Cause of bleed found	425 (45.5%)
Required endotherapy	165 (17.6%)
Further bleeding	57 (6.1%)
Re-started post-endoscopy	395 (42.2%)
Continued at time of presentation	42 (4.5%)
Underwent endoscopy	28 (3%)
Cause of bleed found	11 (1.2%)
Further bleeding	3 (0.3%)
Required endotherapy	5 (0.5%)
Information not available	17 (1.8%)

This table summarises the outcomes and management strategies for the 935 patients in the national cohort who were on DOACs at the time of presentation with AUGIB. Of these, 93.7% had their DOACs discontinued upon presentation. Among those who discontinued DOACs, 81.6% underwent endoscopy, with a cause of bleeding identified in 45.5%, 17.6% requiring endotherapy, and 6.1% experiencing further bleeding. DOACs were restarted post-endoscopy in 42.2% of patients. In contrast, 4.5% continued their DOACs at the time of presentation, with 3% undergoing endoscopy, 1.2% having a cause of bleeding found, 0.5% requiring endotherapy, and 0.3% experiencing further bleeding. Information was not available for 1.8% of patients. Additionally, PCC was administered to 76 patients (8.1%) taking DOACs, and reversal agents were administered to 62 patients (6.6%).

Standard : Timing of endoscopy

Endoscopy is offered within 24 hours of presentation with suspected AUGIB; Offer urgent endoscopy after resuscitation for patients with ongoing haemodynamic instability.

Specific measures: *Median waiting time to OGD for hemodynamically stable and unstable patients; Proportion of (admitted) haemodynamically stable patients who have OGD <24 hours; Correlation of waiting time to OGD and outcomes.*

Table 33: Median waiting time to OGD for patients undergoing endoscopy

Time to endoscopy	Median (hours)	IQR (hours)
For all patients (n=4279)		
Presentation to endoscopy referral (available for 3600)	7.6	2.9 – 18.1
Endoscopy referral to endoscopy performed (available for 3571)	18.3	5.6 – 27.7
Presentation to endoscopy performed (available for 3867)	26	17.1 - 47
For Haemodynamically unstable* patients (n= 1769)		
Presentation to endoscopy referral (available for 1534)	7	2.8 – 17.3
Endoscopy referral to endoscopy performed (available for 1499)	16	5 - 26
Presentation to endoscopy performed (available for 1632)	24.3	14.3 – 46.9
For Haemodynamically stable patients (n=2203)		
Presentation to endoscopy referral (available for 1874)	8.5	3.3 – 18.9
Endoscopy referral to endoscopy performed (available for 1879)	19.5	6.3 – 29.3
Presentation to endoscopy performed (available for 2025)	28	19 - 52

** Haemodynamically unstable: HR >100 and/or SBP<100*

These data illustrate the prioritisation of urgent cases and provides an overview of the overall efficiency of endoscopy services in managing patients with AUGIB.

Table 34: Characteristics and outcomes of patients based on time to endoscopy

	0-24 hours, n = 1715	>24 hours, n = 2152
Age	67 (53, 78)	71 (56, 81)
Haematemesis	623 (36%)	556 (26%)
Hemodynamically unstable*	810 (50%)	827 (41%)
GBS Score	10 (7, 13)	8 (5, 11)
Hb at presentation	90 (72, 112)	96 (74, 120)
Pre-endoscopy peak blood lactate	2.20 (1.36, 3.80)	1.80 (1.20, 2.80)
OOH endoscopy	573 (33%)	488 (23%)
Stigmata of recent bleed	759 (45%)	436 (21%)
Endotherapy	659 (39%)	402 (19%)
IR	73 (4.4%)	34 (1.6%)
Death	169 (10%)	119 (5.6%)
Rebleeding	232 (15%)	142 (7.5%)
LOS	5 (2, 9)	6 (3, 10)

** Haemodynamically unstable: HR >100 and/or SBP<100*

This table compares patients who underwent endoscopy within 24 hours of presentation with those who had the procedure after 24 hours. The analysis shows that patients who received endoscopy within 24 hours tended to be younger, with a median age of 67 years compared to 71 years in those who waited longer. More patients in the early endoscopy group presented with haematemesis (36% vs. 26%) and were haemodynamically unstable (50% vs. 41%). These patients also had higher GBS, lower Hb levels at presentation, and higher pre-endoscopy peak blood lactate levels, indicating more severe presentations. Additionally, early endoscopy was more likely to be performed OOH (33% vs. 23%) and revealed more frequent stigmata of recent bleeding (45% vs. 21%), leading to a higher rate of endotherapy (39% vs. 19%). However, despite the earlier intervention, this group had higher rates of death (10% vs. 5.6%), rebleeding (15% vs. 7.5%), and a shorter median LOS (5 vs. 6 days) compared to those who had endoscopy after 24 hours.

Standard : Endoscopic management

Endoscopic therapy is utilised for ulcers with active bleeding (Forrest 1a and 1b) and non-bleeding visible vessels (Forrest 2a) and may also be used for ulcers that have adherent clots (Forrest 2b); Choice of therapy includes: Injection therapy (e.g. adrenaline), thermal probes (e.g. bipolar electrocoagulation, heater probe), or clips; A second modality (thermal or mechanical therapy) is always used following adrenaline injection; Recurrent bleeding is treated with repeat endoscopic therapy, but subsequent bleeding by trans-arterial embolization or surgery; Band ligation is the preferred treatment for oesophageal variceal bleeding and injection of tissue adhesive (cyanoacrylate or thrombin) for GOV-2 and isolated gastric variceal bleeding.

Specific outcome(s): *Number of endoscopies required to reach a diagnosis and achieve haemostasis; Success of endoscopic haemostasis and frequency of repeat endoscopy (for 2nd look or rebleeding); Findings on endoscopy; Endoscopic therapy modality used.*

Table 35: Number of endoscopies required achieve haemostasis

Outcome	One Endoscopy Only (n=3589) n (%)	Two Endoscopies (n=366) n (%)	Three or More Endoscopies (n=71) n (%)	Missing Information (n=253) n (%)
Endotherapy applied	878/3589 (22.7%)	255/366 (69.7%)	50/71 (70.4%)	57/253 (22.5%)
Haemostasis achieved	715/3589 (18.5%)	221/366 (60.4%)	36/71 (50.7%)	39/253 (15.4%)
Rebleeding	168/3589 (4.3%)	196/366 (53.5%)	55/71 (77.5%)	10/253 (3.9%)
IR	75/3589 (1.9%)	35/366 (9.6%)	7/71 (9.9%)	3/253 (1.2%)
Surgery	23/3589 (0.6%)	6/366 (1.7%)	1/71 (1.4%)	3/253 (1.2%)

This table outlines the outcomes for patients based on the number of endoscopies performed to achieve haemostasis. The majority of patients (83.9%) achieved haemostasis after just one endoscopy, with endotherapy applied in 22.7% of these cases. Rebleeding occurred in 4.3% of patients after the first endoscopy, and a small percentage required IR (1.9%) or surgery (0.6%). In cases where two endoscopies were needed (8.5% of patients), endotherapy was more frequently applied (69.7%), and the rate of rebleeding was significantly higher (53.5%), with 9.6% requiring IR and 1.7% needing surgery. For the small group of patients (1.7%) requiring three or more endoscopies, the challenges were even greater, with 70.4% receiving endotherapy, 77.5% experiencing rebleeding, 9.9% needing IR, and 1.4% requiring surgery. These data highlight the increasing complexity and need for additional interventions in patients requiring multiple endoscopies to achieve haemostasis.

Table 36: Summary of outcomes at 1st and 2nd endoscopy

	1st Endoscopy (All Patients, n=4279) n (%)	2nd Endoscopy (Subset of Patients, n=366) n (%)
Cause of bleed found	2820 (65.9%)	289 (79%)
Stigmata or recent bleed noted	1294 (30.2%)	187 (51.1%)
Endotherapy applied	1159 (27.1%)	195 (53.3%)
Haemostasis achieved	924 (21.6%)	176 (48.1%)
Rebleeding	414 (9.7%)	77 (21%)

This table presents outcomes for all patients at their first endoscopy (4279) and for the subset who required a second endoscopy (366) in the management of AUGIB. During the first endoscopy, a cause of bleeding was identified in 65.9% of cases, with stigmata of recent bleeding noted in 30.2%, endotherapy applied in 27.1%, and haemostasis achieved in 21.6%. Rebleeding occurred in 9.7% of patients after their first endoscopy. In the subset of 366 patients who required a second endoscopy, a bleeding cause was identified more frequently (79%), with stigmata of recent bleeding observed in 51.1% of cases. Endotherapy was applied in 53.3% of second endoscopies, achieving haemostasis in 48.1% of cases. Despite these interventions, rebleeding rates increased to 21% after the second endoscopy, highlighting the complexity and persistence of bleeding in this subset. Details regarding outcomes for patients who required three or more endoscopies were limited and are not reported in this table.

Table 37: Findings on endoscopy

Abnormality found on 1st or 2nd endoscopy	n=4279 n (%)
Any abnormality	2842 (66.4%)
Oesophagitis	699 (16.3%)
Ulcer	1343 (31.4%)
Oesophageal ulcer	235 (5.5%)
Gastric ulcer	501 (11.7%)
Duodenal ulcer	719 (16.8%)
Mallory-Weiss tear	92 (2.1%)
Dieulafoy lesion	51 (1.2%)
Varices	430 (10%)
Oesophageal varices	391 (9.1%)
Gastric varices	74 (1.7%)
Duodenal varices	8 (0.2%)
Portal Hypertensive Gastropathy	203 (4.7%)
GAVE	87 (2%)
Telangiectasia	72 (1.7%)
Post-sphincterotomy bleed	12 (0.3%)
Upper GI malignancy	163 (3.8%)
Other	411 (9.6%)

This table summarises abnormalities detected during first or second endoscopies in the national cohort (4279), with findings in 66.4% of cases. Ulcers were the most common, seen in 31.4% of patients (5.5% oesophageal, 11.7% gastric, 16.8% duodenal). Oesophagitis was present in 16.3%, and varices in 10%, primarily oesophageal (9.1%). Other findings included Mallory-Weiss tears (2.1%), Dieulafoy lesions (1.2%), portal hypertensive gastropathy (4.7%), GAVE (2%), and telangiectasia (1.7%). UGI malignancies appeared in 3.8% of cases, with oesophageal, gastric, and duodenal cancers included. Miscellaneous findings were noted in 9.6% Details regarding outcomes for patients who required three or more endoscopies were limited and are not reported in this table.

Table 38: Stigmata of bleeding

Stigmata of recent haemorrhage found on 1st or 2nd endoscopy	**n=4279) n (%)**
Any stigmata of recent haemorrhage	1311 (30.6%)
Blood in upper GI tract	550 (12.8%)
Spurting vessel	66 (1.5%)
Oozing blood	423 (9.9%)
Visible vessel	234 (5.5%)
Adherent clot	313 (7.3%)
Nipple sign/ Red spot / Wheal markings on varices	221 (5.2%)

This table summarises the presence of stigmata of recent haemorrhage identified during the first or second endoscopy in the national cohort (n=4279). Stigmata of recent haemorrhage were found in 30.6% of patients. The most common findings included blood in the UGI tract in 12.8% of patients, a spurting vessel in 1.5%, and oozing blood in 9.9%. Visible vessels were noted in 5.5% of cases, while adherent clots were present in 7.3%. Additionally, nipple sign, red spots, or wheal markings on varices were observed in 5.2% of patients. Details regarding outcomes for patients who required three or more endoscopies were limited and are not reported in this table.

Table 39: Endoscopic modalities used for treating GI bleeding

Endoscopic therapy used on 1st or 2nd endoscopy	n=4279 n %
Any therapeutic procedure	1230 (28.8%)
Bipolar Electrocoagulation Probe / Heater probe	211 (4.9%)
Endoclip(s) applied	471 (11%)
Argon plasma coagulation	146 (3.4%)
Haemospray	173 (4%)
Endoclot	29 (0.7%)
Purastat	37 (0.9%)
Alternative haemostatic powder/gel	16 (0.4%)
Over the scope clip	16 (0.4%)
Sengstaken tube	20 (0.5%)
Danis stent	9 (0.2%)
Ulcer base injection with adrenaline	562 (13.1%)
Variceal therapy	325 (7.6%)
Other	22 (0.5%)

This table outlines the various therapeutic procedures employed during the first or second endoscopy in the national cohort. Endoscopic therapy was utilised in 28.8% of cases (n=1230), with many patients receiving more than one modality. The most common modalities included the application of endoclips, used in 11% of cases, and ulcer base injection with adrenaline, applied in 13.1% of cases. Other techniques included Bipolar Electrocoagulation Probe / Heater probe (4.9%), Argon plasma coagulation (3.4%), and Haemospray (4%). Less frequently used methods involved Endoclot (0.7%), Purastat (0.9%), and alternative haemostatic powders/gels (0.4%). Mechanical interventions such as over-the-scope clips and Sengstaken tubes were each used in 0.4% and 0.5% of cases, respectively. Danis stents were rarely employed, appearing in only 0.2% of cases. Variceal therapy, such as band ligation, was performed in 7.6% of patients, reflecting the range of endoscopic tools available to manage GI bleeding. Details regarding outcomes for patients who required three or more endoscopies were limited and are not reported in this table.

Table 40: Form of variceal therapy used

Variceal therapy used on 1st or 2nd endoscopy	n=430 n %
Any variceal therapy	343 (79.8%)
Banding	297 (69.1%)
Glue or thrombin injection	19 (4.4%)
Sclerotherapy	6 (1.4%)

This table summarises the different types of variceal therapy applied during the first or second endoscopy in patients with identified varices (430). Variceal therapy was performed in 79.8% of these cases. Banding was the most commonly used method, applied in 69.1% of patients. Other therapies included glue or thrombin injection, used in 4.4% of cases, and sclerotherapy, which was employed in 1.4% of patients. These therapies reflect the varied approaches taken to manage variceal bleeding during endoscopic procedures. Additionally, it is important to note that many patients received more than one form of therapy. Details regarding outcomes for patients who required three or more endoscopies were limited and are not reported in this table.

Table 41: Use of therapy based on stigmata type

Stigmata of bleed noted on 1st or 2nd endoscopy	**n**	**Therapy given n (%)**	**No therapy given n (%)**
Blood in upper GI tract	550	383 (69.6%)	167 (30.4%)
Forrest 1a (spurting)	66	66 (100 %)	0
Forrest 1b (oozing)	423	349 (82.5%)	74 (17.5%)
Forrest 2a (visible vessel)	234	226 (96.6%)	8 (3.4%)
Forrest 2b (adherent clot)	313	241 (77%)	72 (23%)
High risk markings on varices	221	204 (92.3%)	17 (7.7%)

This table presents the relationship between different types of stigmata of recent bleeding observed during endoscopy and the subsequent use of therapeutic interventions. For patients with blood in the UGI tract (550), therapy was administered in 69.6% of cases, while 30.4% did not receive any intervention. For those with a spurting vessel (Forrest 1a, 66), all patients (100%) received therapy. Among patients with oozing blood (Forrest 1b, 423), 82.5% were treated, and 17.5% did not receive therapy. In cases with a visible vessel (Forrest 2a, 234), therapy was applied in 96.6% of patients, and 3.4% did not receive any. For patients with an adherent clot (Forrest 2b, 313), 77% received therapy, while 23% did not. Lastly, for patients with high-risk markings on varices (221), 92.3% received therapy, and 7.7% did not. It is important to note that details regarding outcomes for patients who required three or more endoscopies were limited and are not reported in this table.

Standard : Post-endoscopic management

High dose proton pump inhibitors are used for 72 hours either as continuous infusion, intermittent IV bolus or high dose oral in patients with high-risk ulcers (active bleeding, visible vessel, adherent clot); Antibiotics are continued for up to seven days in patients with cirrhosis regardless of the bleeding source; Vasoactive drugs are used for up to five days in variceal bleeding; A clear plan for resumption of antithrombotic therapy is included, if interrupted, for patients with AUGIB; If variceal bleeding is difficult to control, a Sengstaken– Blakemore tube, or a removable covered metal stent, is inserted until further endoscopic treatment, TIPSS or surgery is performed, depending on the clinical circumstances, local resources, and expertise; Salvage TIPSS is offered where feasible for variceal bleeding refractory to endoscopic therapy; Secondary prophylaxis is initiated prior to hospital discharge in all patients with variceal bleeding i.e. NSBB/band ligation/TIPSS depending on the clinical circumstances.

Specific measures: *Use and duration of PPI, antibiotics, and vasopressors in relation to type of AUGIB as per endoscopy findings; Documentation of plan as per endoscopy report; Number and percentage of patients with variceal bleed initiated on secondary prophylaxis prior to hospital discharge; Frequency and outcomes of embolization, TIPSS, surgery; Number of referrals for TIPSS following a VUGIB and median duration from date of bleed to date of TIPSS if performed; and whether inserted for salvage, pre-emptive, or rebleeding reasons.*

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Table 42: Post-endoscopic management of patients

Medications used/continued post index endoscopy	All Patients undergoing endoscopy (n = 4279) n (%)	Patients with Varices on index endoscopy (n=418) n (%)	Patients with Ulcer on index endoscopy (n=1309) n (%)
PPI	3398 (79.4%)	257 (61.5%)	1251 (96%)
Oral	2356 (55.1%)	120 (28.7%)	765 (58.4%)
IV boluses	868 (20.3%)	130 (31.1%)	324 (24.7%)
IV infusion	660 (15.4%)	38 (9.1%)	420 (32.1%)
Terlipressin / Octreotide	370 (8.6%)	290 (69.4%)	32 (2.4%)
Antibiotics for UGI bleed (except H pylori eradication)	431 (10.1%)	264 (63.2%)	82 (6.3%)
TXA	92 (2.1%)	13 (3.1%)	18 (1.4%)
None of the above	614 (14.3%)	30 (7.2%)	42 (3.2%)

This table provides an overview of the medications used or continued after the index endoscopy in patients with AUGIB. Among the 4279 patients who underwent endoscopy, PPIs were the most commonly used medications, with 79.4% of patients receiving them. Specifically, 55.1% received PPIs orally, 20.3% received IV boluses, and 15.4% were on IV infusions. For patients with varices identified on endoscopy (418), 61.5% were given PPIs, with a significant number also receiving terlipressin or octreotide (69.4%) and antibiotics (63.2%). For patients with ulcers on endoscopy (1,309), PPIs were administered to 95.6%, with 58.4% receiving oral PPIs, 24.7% IV boluses, and 32.1% IV infusions. Additionally, 8.6% of all patients received terlipressin or octreotide, 10.1% received antibiotics (excluding those for H. pylori eradication), and 2.1% were given TXA.

Notably, 14.3% of all patients did not receive any of the listed therapies. The duration of these medications post-endoscopy was inconsistently reported, limiting further analysis.

Table 43: Post-endoscopic documentation of a clear plan in the report by the endoscopist for patients undergoing endoscopy

Documented plan for	n = 4279 n (%)
Re-bleeding	1602 (37.4%)
Restarting anti-thrombotic agents	487 (11.4%)
Consideration for LMWH	69 (1.6%)
Need for gastroenterology referral	738 (17.2%)
Need for IR	323 (7.5%)
Need for surgical referral	147 (3.4%)

This table highlights the extent to which clear post-endoscopy plans were documented for patients who underwent endoscopy (4279). The documentation covered several critical areas: re-bleeding plans were documented for 37.4% of patients, while plans for restarting antithrombotic agents were noted in 11.4% of cases. Consideration for LMWH was documented in 1.6% of patients. Additionally, referrals for gastroenterology were indicated in 17.2% of cases, referrals for IR were noted in 7.5%, and surgical referrals were documented in 3.4% of cases. These data show endoscopists need to be better at documenting next steps.

Table 44: Outcomes for patients found to have varices

	Variceal endotherapy n (%)	Sengstaken Tube n (%)	TIPSS n (%)	Discharged on NSBB n (%)	Mortality n (%)
Overall (n=430)	343 (79.8%)	23 (5.3%)	8 (1.9%)	239 (55.6%)	59 (13.7%)
Oesophageal varices (n=391)	317 (81.1%)	18 (4.6%)	7 (1.8%)	220 (56.3%)	55 (14,1%)
Gastric varices (n=74)	55 (74.3%)	8 (10.8%)	2 (2.7%)	45 (6.1%)	7 (9.6%)
Duodenal varices (n=8)	4 (50%)	0	0	1 (12.5%)	1 (12.5%)

This table summarizes management and outcomes for patients diagnosed with varices during endoscopy (430). Variceal endotherapy was performed in 79.8% of cases, with Sengstaken tube use in 5.3% and TIPSS in 1.9%. Overall, 55.6% of patients were discharged on NSBB and mortality was 13.7%.

For oesophageal varices (391), 81.1% underwent endotherapy, 4.6% required a Sengstaken tube, 1.8% had TIPSS, and 56.3% were discharged on NSBB, with a mortality rate of 14.1%. Among patients with gastric varices (74), 74.3% received endotherapy, 10.8% required a Sengstaken tube, 2.7% underwent TIPSS, and 6.1% were discharged on NSBB, with a lower mortality of 9.6%. For duodenal varices (8), 50% received endotherapy, and 12.5% were discharged on NSBB, with a similar mortality rate of 12.5%.

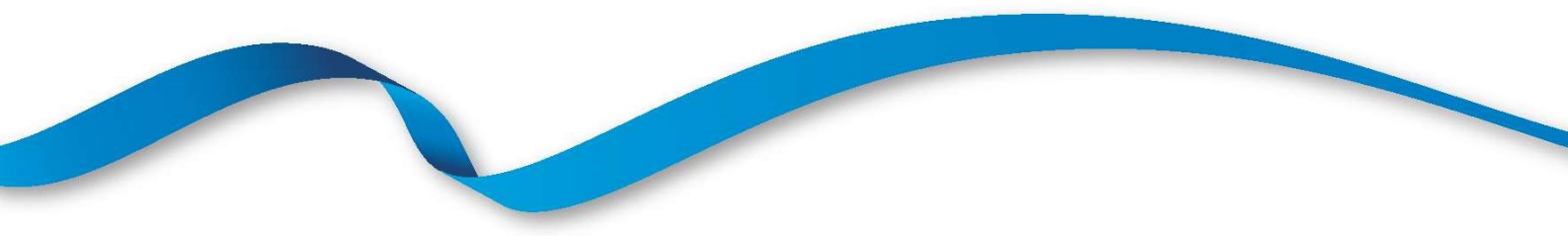

Table 45: Use of TIPSS for specific indication as per BSG guidelines

	Eligible for TIPSS as per BSG guidelines	TIPSS performed
Salvage TIPSS	7%	1.6%
Early/ Pre-emptive TIPSS	11%	0.5%
Secondary prevention	13%	0.5%

This table outlines the eligibility and utilisation of TIPSS among patients in the national cohort. According to the BSG guidelines, 30% (130) of patients met the criteria for TIPSS. However, only 9% (12/130) were discussed for TIPSS before discharge, and 6% (8/130) actually underwent the procedure. The table breaks down the TIPSS use by specific indications: Salvage TIPSS was indicated in 7% of eligible patients but was performed in only 1.6%, Early/Pre-emptive TIPSS was indicated in 11% but performed in only 0.5%, and TIPSS for secondary prevention was indicated in 13% but again performed in just 0.5%. For the patients who underwent TIPSS, data on the timing from presentation to the procedure was available for 7 patients, with a median time of 130.2 hours (IQR: 95.4–230). These figures highlight a significant gap between guideline-based indications and the actual use of TIPSS, reflecting possible barriers or delays in the procedure's application.

Table 46: Patients undergoing Interventional Radiology

Previous endoscopy	n=133 n (%)
No endoscopy	13 (9.8%)
One endoscopy	75 (56.4%)
Two endoscopies	35 (26.3%)
Three or more endoscopies	7 (5.3%)
Missing information on no. of endoscopies	3 (2.3%)

This table provides a summary of the interventions and outcomes for patients who underwent IR procedures. Among the 133 patients who received an IR procedure, 56.4% had undergone one previous endoscopy, 26.3% had undergone two endoscopies, and 5.3% had undergone three or more endoscopies before the IR intervention. Notably, 9.8% of these patients had not undergone any endoscopy prior to the IR procedure. The median time interval from the date and time of presentation to the IR procedure was 43.4 hours (IQR 14-111.9 hours). This data underscores the role of IR as a subsequent or alternative therapeutic option in managing AUGIB, particularly when initial endoscopic interventions are insufficient or when patients present in a condition that precludes immediate endoscopy.

Table 47: Use of different IR procedures and success with need for re-embolisation

Procedure	Patients undergoing IR (n=133)* n (%)	Was adequate haemostasis achieved/noted n (%)	Further bleeding after the first procedure n (%)	Re-embolisation attempted n (%)
Diagnostic CT angiography alone	61 (45.9%)	15/61 (24.6%)	8 (13.1%)	-
Diagnostic and therapeutic angiography	52 (39.1%)	47/52 (90.4%)	8 (15.4%)	-
Empiric embolization undertaken because there was no identified bleeding on angiography, but bleeding was seen on CT angiography	3 (2.3%)	2/3 (66.7%)	-	-
Empiric embolization undertaken because there was no identified bleeding on angiography, but bleeding was seen on prior endoscopy	10 (7.5%)	9/10 (90%)	3/10 (30%)	-
Empiric embolization undertaken because there was no identified bleeding on angiography or on prior endoscopy	-	-	-	-
Transjugular Intrahepatic Portosystemic Shunt (TIPSS) only	6 (4.5%)	5/6 (83.3%)	1 (16.7%)	-

Transjugular Intrahepatic Portosystemic Shunt (TIPSS) with delayed embolization	-	-	-	-
Balloon-occluded Retrograde Transvenous Obliteration (BRTO)	-	-	-	-
Plug-assisted Retrograde Transvenous Obliteration (PARTO) or coil-assisted Retrograde Transvenous Obliteration (CARTO)	-	-	-	-
Information on procedure type missing	9 (6.8%)	3/9 (33.3%)	-	-

** For 8 patients more than one procedure was selected*

This table outlines the various IR procedures performed and their outcomes. Among the 133 patients who underwent IR, diagnostic CT angiography alone was performed in 45.9% of cases, with adequate haemostasis noted in 24.6% of these cases, and further bleeding noted in 13.1%. Diagnostic and therapeutic angiography was performed in 39.1% of patients, achieving a high success rate of 90.4% in controlling bleeding, though further bleeding was observed in 15.4% of cases. Empiric embolisation based on bleeding seen on prior endoscopy or CT angiography was used in a small number of patients (7.5%), with a 90% success rate in controlling bleeding. However, 30% of these cases experienced further bleeding. TIPSS alone was performed in 4.5% of patients, with an 83.3% success rate in achieving adequate haemostasis and a 16.7% further bleeding rate. No re-embolisation was attempted following any of these procedures, indicating the definitive nature of the interventions. These results highlight the varying success rates of different IR procedures in managing acute GI bleeding.

Table 48: Characteristics of patients undergoing surgical interventions

Previous endoscopy	**n=38 n (%)**
No endoscopy	5 (13.2%)
One endoscopy	23 (60.5%)
Two endoscopies	6 (15.8%)
Three or more endoscopies	1 (2.6%)
Missing information on no. of endoscopies	3 (7.9%)

This table details the circumstances and results for the 38 patients who required surgical intervention for AUGIB. Among these patients, 60.5% had undergone one endoscopy prior to surgery, 15.8% had undergone two endoscopies, and 2.6% had undergone three or more endoscopies. Notably, 13.2% of patients had not undergone any endoscopy before the surgical intervention. The median time from presentation to surgery was 65.7 hours (IQR 21-157.8 hours).

Table 49: Reason for surgery

	n=38 n (%)
For further uncontrolled bleeding	20 (52.6%)
Stigmata of recent haemorrhage/ high risk	1 (2.6%)
For malignancy	10 (26.3%)
For peritonitis/perforation	2 (5.3%)
Other/ Miscellaneous	8 (21.1%)

This table provides insights into the underlying reasons why surgery was performed in patients with AUGIB. Among the 38 patients who underwent surgical intervention, the primary reason was uncontrolled bleeding, which accounted for 52.6% of the cases. Surgery was performed for malignancy in 26.3% of patients, highlighting the role of surgical intervention in managing bleeding associated with GI cancers. Peritonitis or perforation was the cause in 5.3% of cases, indicating instances where surgery was necessary to address complications beyond bleeding. Stigmata of recent haemorrhage or high-risk lesions were the reason for surgery in 2.6% of cases. The remaining 21.1% of surgeries were performed for other miscellaneous reasons reported as “free text”.

Table 50: Surgical intervention type

Reason	**n=38 n (%)**
Duodenotomy and underrunning of the vessel	5 (13.2%)
Pyloro-duodenotomy and underrunning of the vessel	2 (5.3%)
Oversew or plication of the ulcer	5 (13.2%)
Gastrectomy (partial or other)	6 (15.8%)
+/- Ligation of the gastroduodenal artery	1 (2.6%)
Laparoscopic /open wedge excision of bleeding lesion	2 (5.3%)
Other/ Miscellaneous	18 (47.4%)

This table provides a breakdown of the different surgical procedures performed on patients with AUGIB who required surgery (38). The most common procedures included gastrectomy (partial or other), which was performed in 15.8% of cases, and duodenotomy with underrunning of the vessel, conducted in 13.2% of patients. Oversewing or plication of the ulcer was another common intervention, accounting for 13.2% of the surgeries. Less frequent procedures included pyloro-duodenotomy with underrunning of the vessel (5.3%), laparoscopic or open wedge excision of the bleeding lesion (5.3%), and ligation of the gastroduodenal artery (2.6%). A significant portion of the surgeries (47.4%) were categorised under "Other/Miscellaneous" interventions – captured as “Free

text”, highlighting the variety of surgical approaches used based on the specific clinical circumstances. These included complex procedures such as oversewing of bleeding tumours, total colectomies, Endoscopic Retrograde Cholangiopacreatography with therapeutic interventions (e.g. sphincterotomy, stent replacement) in theatre with surgical support, laparotomies with transhiatal drainage or feeding jejunostomy placement, patch repairs of duodenal ulcers, excision of gastrointestinal stromal tumours (GISTs) at different sites, and resections involving multiple organs (e.g. distal pancreatectomy and splenectomy). Additionally, there were instances of managing internal hernias, such as Petersen’s hernia, and performing endovascular aneurysm repair (EVAR) alongside duodenal repair.

Section 2: Organisation of care & Organisational audit standards

Sites were asked to provide information about the services the provide and the resources available to provide them. Collecting this information allows us to understand why there may be performance and quality differences and to address them, and facilitates comparative analysis that can point the way to service improvement. Note that for this section, the standards are based on expert consensus on how the provision of a service should be modelled, and not on any guideline or evidence-based research. They are, therefore, to some extent ideal and should be regarded as aspirational targets. Comparison, as with Table 50 below, must be exercised with caution. The differences in numbers are illustrative and not absolute and reflect a changing pattern in the provision of healthcare but can point to useful areas for exploration. For example, in 2007 7% of sites had a designated GI bleeding unit, whereas this audit found that in 2022 18% now have one. Knowing this allows further work on if having such a unit makes a significant difference to care, such that it ought to become a target for all Trusts to achieve.

Standard : Patients with any acute GI bleed are only admitted to hospitals with 24/7 access to on-site endoscopy, interventional radiology (on-site or covered by a formal network), on-site GI bleed surgery, on-site critical care and anaesthesia.

Specific measures: *Number of UK hospitals with 24/7 access to gastroscopy for AUGIB; Proportion of UK hospitals with no provision for out of hours endoscopic therapy for AUGIB; Availability of a consultant-led service and the competence of on-call endoscopists at providing therapy at upper GI endoscopy; Availability of out of hours endoscopy nurses; Proportion of UK hospitals with on-site IR or access via an agreed referral pathway and proportion with no arrangements in place; Number of UK hospitals with access to emergency surgery on site (for complicated UGI bleed); Availability of level 2 and 3 care.*

Table 51: Availability of on-site facilities

	2007 audit (n=205) **n (%)**	**2022 audit (n=121)** **n (%)**
A&E	194 (95%)	119 (98%)
Acute medical admissions ward	193 (94%)	120 (99%)
Acute surgical admissions ward	151 (74%)	113 (93%)
Designated GI bleeding unit	15 (7%)	22 (18%)
HDU / Level 2 care	187 (91%)	111 (92%)
ITU / Level 3 care	194 (95%)	117 (97%)
Endoscopy unit on site	204 (99%)	120 (99%)
Access to therapeutic endoscopy for AUGIB	192 (94%)	120 (99%)
Access to Interventional radiology On-site TIPSS	48 (23%) -	79 (65%) 29 (24%)
Access to Emergency surgery for AUGIB	150 (73%)	117 (97%)

This table compares the availability of key on-site medical facilities in hospitals between the 2007 and 2022 audits. The 2022 audit shows an improvement in the availability of critical services. For instance, 98% of hospitals now have an A&E department, up from 95% in 2007. Similarly, access to acute medical admissions wards increased to 99% from 94%, and access to acute surgical admissions wards grew to 93% from 74%. The availability of designated GI bleeding units has more than doubled, from 7% to 18%. The availability of HDUs or Level 2 care slightly increased to 92% from 91%, and ITUs or Level 3 care saw a slight increase to 97% from 95%. Endoscopy units are available on-site in 99% of hospitals, consistent with the previous audit. The audit also reports an increase in access to therapeutic endoscopy for AUGIB, now at 99%, up from 94% in 2007. Access to IR, including on-site TIPSS, has significantly improved, with 65% of hospitals providing on-site access to IR, a substantial increase from the 23% reported in 2007. Access to emergency surgery for AUGIB also saw a significant increase, from 73% in 2007 to 97% in 2022, reflecting an overall enhancement in the preparedness of hospitals to manage AUGIB.

Table 52: Out-of-hours endoscopy and staffing provisions

	2007 audit (n=205) n (%)	**2022 audit (n=121) n (%)**
OOH endoscopy accessible on site i.e. 24/7 access to gastroscopy for AUGIB	189 (92%)	112 (92%)
Formal OOH consultant endoscopy on-call rota	106/189 (56%)	105/112 (94%)
Site for OOH endoscopy:		
Main endoscopy	74/189 (39%)	36/112(32%)
Theatres	159/189 (84%)	111/112 (99%)
ITU	NA	51/112 (45%)
Others	35/189 (18%)	24/112 (21%)

This table compares the availability of OOH endoscopy services and related staffing provisions between the 2007 and 2022 audits. In 2022, 92% of hospitals (121) reported having OOH endoscopy accessible on-site, consistent with the 92% reported in 2007. There was a significant increase in the presence of a formal OOH consultant endoscopy on-call rota, rising from 56% in 2007 to 94% in 2022. Additionally, 54% of the hospitals reported having a lead clinician responsible for integrated pathways and governance of upper and lower gastrointestinal bleeding.

The average number of gastroenterologists and hepatologists per hospital were 10.3 (Median 10, IQR 6-14); The average number of hepatologists - 2.4 (median 1, IQR 0-4); The average number of gastroenterologists with special interest in hepatology – 1.8 (median 1.5, IQR 0-3).31% (37/121) of sites have no hepatologists and 6% (7/121) have no hepatologists not gastroenterologists with a special interest in hepatology. These data highlight significant advancements in the availability and organisation of OOH endoscopy services, though gaps in specialised staffing remain.

Standard : There is availability of both an on-call gastrointestinal endoscopist proficient in endoscopic haemostasis and on-call support staff with technical expertise in the usage of endoscopic devices enables performance of endoscopy on a 24/7 basis.

Specific measures: *Mean number of endoscopists on an out of hours rota and proficient with therapeutic modalities; Availability of trained nurses involved in out of hours endoscopy in the use of therapeutic endoscopy equipment.*

Table 53: Out-of-hours endoscopy and staffing provisions

	2007 audit (n=205) n (%)	**2022 audit (n=121) n (%)**
OOH endoscopy accessible on site	189 (92%)	112 (92%)
Formal OOH consultant endoscopy on-call rota	106/189 (56%)	105/112(94%)
Total number of endoscopists on on-call rota	638	1073
Average number of endoscopists on on-call rota	6.6 (median 6, IQR 5-8)	10.2 (median 10, IQR 7-12)
Formal OOH endoscopy nurses rota	76/189 (40%)	71/112 (63%)
Trained nursing staff for OOH endoscopy	101/189 (53%)	93/112 (83%)

This table compares the availability and organisation of OOH endoscopy services between the 2007 and 2022 audits. In 2022, 92% of hospitals reported having OOH endoscopy accessible on-site, consistent with the 92% reported in 2007. The presence of a formal OOH consultant endoscopy on-call rota significantly increased, from 56% in 2007 to 94% in 2022. The total number of endoscopists on the on-call rota grew from 638 in 2007 to 1,073 in 2022, with the average number of endoscopists per hospital increasing from 6.6 (median 6, IQR 5-8) in 2007 to 10.2 (median 10, IQR 7-12) in 2022. Additionally, the availability of a formal OOH endoscopy nurses rota improved from 40% to 63%, and the availability of trained nursing staff for OOH endoscopy increased from 53% to 83%. These findings highlight substantial improvements in the staffing and organizational capacity for delivering OOH endoscopy services. The details on individual endoscopists per hospital was reported for 1067 endoscopists.

Table 54: Grade and specialty of endoscopist on AUGIB on-call rota

	n=1067
Grade	
Consultants	993 (93%)
SpR/SAS	63 (6%)
Missing/Other	11 (1%)
Specialty	
Physicians	982 (92%)
Surgeons	66 (6%)
Missing	19 (2%)

This table provides a detailed breakdown of the qualifications and specialties of endoscopists involved in the management of AUGIB across the UK, based on data from the 2022 audit. The majority of endoscopists on the on-call rota were consultants, representing 93% of the total. Specialty Registrars (SpR) or Staff Grade, Associate Specialist (SAS) doctors made up 6%, with a small percentage (1%) being categorised under other or missing data (n=11). Regarding specialties, 92% of the endoscopists were physicians, with surgeons comprising 6%. A small number (2%) had missing information regarding their specialty. These findings highlight that the AUGIB on-call rota is predominantly consultant-led, with a significant representation of physicians specialised in gastroenterology.

Table 55: Endoscopic modality proficiency count per endoscopist

Endoscopic Modality	**Proficient Count n=1067 n (%)**
Adrenaline injection	1062 (99.53%)
Thermal device	1038 (97.28%)
Varices banding	1015 (95.13%)
Glue or thrombin	766 (71.79%)
Hemospray	1055 (98.88%)
Argon Plasma Coagulation	1023 (95.88%)
Haemostatic clips	1041 (97.56%)
Over the scope clips	319 (29.90%)
Danis stent	270 (25.30%)
Balloon tamponade	1036 (97.09%)
All Modalities	176 (16.49%)

This table presents data on the proficiency of individual endoscopists in various therapeutic modalities used in managing AUGIB. According to the 2022 UK audit data, the vast majority of endoscopists are proficient in adrenaline injection (99.5%), thermal device use (97.3%), varices banding (95.1%), and haemostatic clips (97.6%). Other modalities, such as glue or thrombin injection (71.8%) and Hemospray (98.9%), also show high proficiency rates. However, proficiency in more advanced techniques, such as the use of over-the-scope clips and Danis stents, was significantly lower, at 29.9% and 25.3%, respectively. Notably, only 16.5% of endoscopists were proficient in all modalities, indicating a potential area for improvement in training and skill development for managing complex AUGIB cases.

Standard : Endoscopy lists are organised to ensure that AUGIB emergencies can be prioritised and all patients with AUGIB have their endoscopy within 24 hours; Units seeing more than 330 cases a year offer daily endoscopy lists; Units seeing fewer than 330 cases a year arrange their service according to local circumstances.

Specific measures: *Number of UK hospitals with dedicated emergency slots for AUGIB with availability over the week and the weekend; Estimated annual number of GI bleeding patients presenting to the hospital.*

Table 56: Endoscopy list provisions for hospitals with OOH endoscopy

	2007 audit (n=189) n (%)	**2022 audit (n=112) n (%)**
Weekday emergency slots	62% (118)	101 (90%)
Weekend emergency slots	N/A	47 (42%)
Saturday slots	-	45/47 (96%)
Sunday slots	-	29/47 (62%)
7 days protected slots	N/A	28/112 (25%)

This table highlights the improvements in the organisation of emergency endoscopy services between the 2007 and 2022 audits. The 2022 audit shows that 90% of hospitals with OOH endoscopy services now have dedicated emergency slots available on weekdays, a significant increase from 62% in 2007. Additionally, 42% of hospitals reported having weekend emergency slots, with 96% of these offering slots on Saturday and 62% on Sunday. A quarter of hospitals (25%) reported having seven days of protected emergency slots, indicating enhanced prioritisation of endoscopy for AUGIB. These improvements reflect the growing recognition of the need for timely endoscopic intervention across the entire week to manage patients with AUGIB effectively.

Table 57: Annual GI bleed caseloads for sites with OOH endoscopy

	n=112 n (%)	**Weekday emergency slots n/n (%)**	**Weekend emergency slot**		**7 days protected slots**
			Saturday slots **n/n (%)**	Sunday slots **n/n (%)**	**n/n (%)**
<100	8 (7.1%)	3/8 (37.5%)	1/8 (12.5%)	1/8 (12.5%)	0
101-200	34 (30.4%)	29/34 (85.3%)	10/34 (29.4%)	10/34 (29.4%)	8/34 (23.5%)
201-300	19 (17%)	14/19 (73.7%)	5/19 (26.3%)	4/19 (21%)	3/19 (15.8%)
>300	47 (42%)	43/47 (91.5%)	27/47 (57.4%)	26/47 (55.3%)	14/47 (29.8%)
Missing	4 (3.6%)	4/4 (100%)	1/4 (25%)	1/4 (25%)	1/4 (25%)

This table illustrates the distribution of GI bleed cases across hospitals offering OOH endoscopy services, based on the 2022 audit. The table categorises sites by their annual GI bleed caseload and highlights the availability of emergency endoscopy slots during weekdays and weekends. Hospitals with the highest caseloads (>300 cases annually) accounted for 42% of the sites and provided the most comprehensive coverage, with 91.5% offering weekday emergency slots, 57.4% having Saturday slots, 55.3% with Sunday slots, and 29.8% providing seven days of protected emergency slots. In contrast, sites with lower caseloads (<100 annually) made up only 7.1% of the cohort and

had minimal availability, with 37.5% offering weekday slots, 12.5% providing Saturday slots, and 12.5% offering Sunday slots, with no sites offering seven days of protected slots. Sites with intermediate caseloads (101-200 and 201-300 cases annually) had varying levels of service availability, reflecting their role in providing emergency endoscopy services. The data underscores the correlation between higher caseloads and the availability of emergency endoscopy slots, suggesting that sites managing more GI bleed cases are better equipped to provide continuous care, especially during weekends.

Standard : Minimal monitoring during procedures for major AUGIB include blood pressure, pulse oximetry and ECG. Monitoring is provided by suitably skilled individuals who are separate from the procedural team and available 24/7.

Specific measure: *Availability of blood pressure, pulse oximetry and ECG during emergency and out of hours endoscopy.*

Table 58: Monitoring during procedures

	2007 audit (n=205) n (%)	**2022 audit (n=121) n (%)**
Blood pressure	165 (80%)	111 (92%)
Pulse oximetry	191 (93%)	114 (94%)
ECG	96 (47%)	95 (78%)

This table compares the availability of key monitoring equipment between the 2007 and 2022 audits. The 2022 audit shows improvements in the availability of these essential monitoring tools. Blood pressure monitoring was available in 92% of hospitals, an increase from 80% in 2007. Pulse oximetry, which was already widely available in 93% of hospitals in 2007, remained nearly consistent, rising slightly to 94% in 2022. The most significant improvement was seen in ECG monitoring, which increased from 47% availability in 2007 to 78% in 2022. These developments highlight the progress made in ensuring that hospitals are better equipped to monitor patients during emergency and OOH endoscopy, contributing to improved patient safety and care.

Standard : There are a minimum of six interventional radiologists on an out of hours rota.[35]

Specific measure: *Mean number of interventional radiologists on an out of hours rota where available.*

Table 59: IR service

	n=121 **n (%)**
Access to any IR service	106 (88%)
On-site 24/7 IR service	47/106 (44%)
Day-time IR service with a networked 24/7 service	24/106 (23%)
Only day-time on-site service	9/106 (8%)
Only a network cover with no local IR service	28/106 (26%)
Access to on-site IR service	79 (65%)
For arterial embolization	79/79 (100%)
For Trans-jugular intrahepatic portosystemic shunt (TIPSS)	29/79 (37%)
For Balloon – occluded retrograde transvenous obliteration (BRTO)	13/79 (16%)
Average number of interventional radiologists on on-call rota for sites with 24/7 on-site IR service	5.4 (median 6, IQR 3.5-13)

This table summarises the availability of IR services in hospitals based on the 2022 audit (n=121). Access to any IR service was available in 88% of hospitals, with 44% having a 24/7 on-site IR service, 23% having a day-time IR service with networked 24/7 coverage, 8% offering only a day-time on-site service, and 26% relying solely on network cover with no local IR service. Specifically, 65% of hospitals had on-site IR services for arterial embolisation, 37% for TIPSS and 16% for BRTO. The average number of interventional radiologists on the on-call rota for sites with 24/7 on-site IR services was 5.4, with a median of 6 and an IQR of 3.5-13. These figures highlight the varying levels of access to critical IR services and the staffing resources available to provide these interventions in an OOH setting.

Standard : A massive transfusion protocol is available in all hospitals

Specific measure: *Availability of guidelines on the management of major haemorrhage.*

The 2022 audit shows a significant improvement, with 99% of hospitals (n=121) reporting the availability of written guidelines, up from 49% (n=101) in 2007. This near-universal adoption reflects an increased emphasis on standardised protocols to manage major haemorrhage effectively across hospitals.

Standard : Local arrangements are in place to provide compatible blood urgently for patients with major bleeding.

Specific measure: *Availability of on-call transfusion laboratory staff.*

The 2022 audit shows that 98% of hospitals (n=121) had on-call transfusion laboratory staff available, reflecting a slight improvement from 96% (n=196) in 2007. This high level of availability underscores the importance of ensuring that critical transfusion services are accessible around the clock to support the management of AUGIB and other emergencies.

Standard : Guidelines on gastrointestinal bleeding are available in all hospitals.

***Specific measures**: Availability of written guidelines on the management of AUGIB; Availability of separate written guidelines on the management of VUGIB and NVUGIB.*

Table 60: Guidelines

	2007 audit (n=205) n (%)	**2022 audit (n=121) n (%)**
Routine use of AUGIB care bundle	N/A	52 (43%)
Guidelines		
Written guidelines for the management of AUGIB	80% (165)	96 (79%)
Separate guidelines for variceal and non-variceal bleeds	N/A	63/96 (66%)
Written guidelines include use of TXA	N/A	8 (8%)
Routine AUGIB audit	84% (172)	108 (89%)

This table shows that in 2022, 79% of hospitals (n=121) reported having written guidelines for managing AUGIB, a slight decrease from 80% (n=165) in 2007. Notably, 66% of these hospitals had separate guidelines for managing variceal and non-variceal bleeds. Additionally, 8% of hospitals included the use of TXA in their guidelines despite recommendations against its use in AUGIB. The 2022 audit also looked at the routine use of an AUGIB care bundle, which was reported by 43% of hospitals. Routine auditing of AUGIB was performed by 89% of hospitals in 2022, an increase from 84% in 2007.

Discussion

The 2022 UK Audit of AUGIB highlights shifts in the patient demographic, improvements in management practices, and ongoing variability in clinical standards across NHS hospitals. Compared to 2007, this audit highlights an older, more comorbid patient population, with increased use of anticoagulants (31% vs. 13%) and CLD prevalence (16% vs. 9%), necessitating individualised care to balance bleeding risks with intervention needs. Common presenting symptoms included melaena (57%) and haematemesis (31%), with nearly half of patients exhibiting haemodynamic instability. Early risk stratification, particularly through the GBS, is essential in identifying low-risk patients who may be safely discharged, while also supporting resource allocation. However, only 58% of cases documented risk scores, and high-risk patients (GBS ≥12, calculated using raw data captured in the audit) showed elevated rebleeding and mortality rates (15% and 17%, respectively). Consistent use of risk stratification can guide decision-making, reducing unnecessary admissions for low-risk patients while ensuring timely care for those at high risk. The BSG AUGIB care bundle[10] was designed to standardise early management and improve outcomes, yet only 17% of cases in this audit documented care bundle completion within 24 hours. This variability likely reflects operational constraints and educational gaps. Reinforcing care bundle adherence through clearer guidelines and training could enhance early intervention and improve high-risk patient outcomes. Approximately half of AUGIB patients received RBC transfusions. However, NICE-recommended restrictive transfusion policies[40] were inconsistently followed, with only 36.9% of patients transfused at or below the Hb threshold of 70 g/L. While 71.5% of transfusions were administered at Hb ≤80 g/L, clinicians often adopted a more conservative approach initially due to hemodynamic instability or ongoing bleeding. Although early liberal transfusion may seem necessary, randomised controlled trials indicate that restrictive strategies improve outcomes [9,13], underscoring the need for clinician education on the benefits of strict transfusion thresholds. IV crystalloids, recommended for initial stabilisation[10], were administered in only 68% of cases, suggesting that adherence to guidelines could reduce the need for RBC transfusions. Access to inpatient endoscopy has improved since 2007, with 83% of patients undergoing an endoscopic procedure, up from 74%. Notably, 66% of these endoscopies identified a cause of bleeding, while 34% were normal findings, and only about a third of patients ultimately required endotherapy. Although the goal of performing endoscopy within 24 hours of presentation is not consistently met, the audit reveals that expanded access to OOH endoscopy, dedicated inpatient slots, and increased weekend availability likely contributes to better patient outcomes. Addressing prioritisation gaps, especially for haemodynamically unstable patients, and incorporating prediction models to better triage and allocate resources could further enhance efficiency and care delivery. Furthermore, the limited availability of advanced therapeutic modalities, such as over-the-scope clips and Danis stents (present in fewer than 30% of cases), emphasises the need for expanded training in high-demand settings.

Post-endoscopic management increasingly relies on IR and selective surgery for persistent or recurrent bleeding. Surgical interventions have decreased to 0.7%, while IR use stands at 2.6%, often as a secondary intervention where endoscopy is insufficient. This shift highlights IR's role in achieving haemostasis for complex cases, underscoring the need for accessible IR services, especially in high-volume centres. The audit reveals ongoing disparities in OOH and IR resources, with only 42% of hospitals offering weekend emergency endoscopy and less than 36% providing 24/7 IR access. While over 90% of sites offer some OOH endoscopy, increasing full 24/7 service availability would improve timely access to care across all regions. Operational challenges impacted data collection and entry, underscoring the need for robust infrastructure in future audits. Additionally, the COVID-19 pandemic affected clinical practice and training, which may have impacted data capture. Variability in data accuracy stemmed from inconsistent supervision of trainee data collectors and a lack of systematic handovers. Data entry delays due to technical limitations, such as outdated

internet browsers, caused some sites to revert to manual submissions, adding to NHS Blood and Transplant staff workload. Clear guidelines, IT upgrades, and improved training could streamline future data collection processes for such clinically important UK wide audits.

Conclusion

The 2022 audit underscores progress in AUGIB management, especially in endoscopic access and transfusion practices, while identifying persistent challenges in care delivery. Addressing operational and clinical gaps will further support high-quality, equitable AUGIB care across the UK. By implementing these recommendations, hospitals can improve care outcomes, reduce variability, and enhance patient safety.

Note

This report presents key highlights from the 2022 UK AUGIB audit. Further detailed publications are planned to address additional areas of clinical uncertainty and provide in-depth analysis of specific management aspects, including the impact of changes in organisational care on outcomes, comprehensive evaluation of endoscopy and transfusion data, focused insights into variceal management and care for patients with chronic liver disease, and the development of updated prediction tools. These future studies will also explore novel methodologies, such as machine learning approaches, to enhance risk stratification and improve patient outcomes.

Key Recommendations:

Clinical Care

- Ensure consistent implementation of validated risk scores and the British Society of Gastroenterology (BSG) AUGIB consensus care bundle at presentation, particularly in emergency departments (ED) and acute medical units (AMU).
- Adhere to national guidelines for restrictive thresholds for red cell transfusions (Haemoglobin (Hb) <70 g/L for stable patients, except in acute coronary syndrome (ACS)). Use single-unit red blood cell (RBC) transfusions for stable patients and reassess the patient's clinical status and Hb before transfusing further units.
- Increase adherence to guideline-recommended management plans for patients with variceal and non-variceal bleeding.
- Focus on strategies to reduce unnecessary endoscopies, especially for low-risk patients, to optimise resource utilisation.

Organisational Care

- Ensure protected daily emergency endoscopy slots and formal 24/7 on-call endoscopy rotas.
- Address gaps in access to interventional radiology, including formal networks for transfer and repatriation. Aim for universal availability of minimally invasive haemorrhage control techniques. Establish clear pathways for timely access to interventional radiology (IR) and transfer for centres lacking on-site 24/7 IR or surgical services.
- Conduct annual local audits on AUGIB management, focusing on transfusion practices, care bundle compliance, and training gaps.

Training

- Improve trainee access to AUGIB cases and therapeutic endoscopy through increased supervision and structured involvement on semi-elective inpatient lists and in on-call rotas during the final years of training.
- Promote attendance at the Joint Advisory Group on Gastrointestinal Endoscopy (JAG) Haemostasis Course for trainees managing AUGIB.
- Ensure future iterations of training curricula include endoscopic haemostasis as a core competency.

Additional recommendations

- Encourage regional collaboration between hospitals to standardise AUGIB care delivery, particularly for complex cases requiring IR or surgery.

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Appendix One – List of participating sites

Participated and included cases to audit

Aberdeen Royal Infirmary, Aberdeen

Addenbrooke's Hospital, Cambridge

Aintree University Hospital, Liverpool

Altnagelvin Area Hospital, Londonderry

Arrowe Park Hospital , Wirral

Barnsley Hospital

Basingstoke and North Hampshire Hospital

Bedford Hospital

Birmingham City Hospital

Birmingham Heartlands Hospital

Borders General Hospital, Melrose

Bradford Royal Infirmary

Bristol Royal Infirmary

Caithness General Hospital

Causeway Hospital, Coleraine

Central Campus (Royal Hallamshire Hospital & Weston Park Hospital), Sheffied

Charing Cross Hospital

Chelsea and Westminster Hospital

Chesterfield Royal Hospital

Colchester Hospital

Countess of Chester Hospital

Croydon University Hospital

Cumberland Infirmary

Darent Valley Hospital, Dartford

Darlington Memorial Hospital

Derriford Hospital, Plymouth

Doncaster Royal Infirmary

Dorset County Hospital

Dumfries and Galloway Royal Infirmary

Ealing Hospital

East Surrey Hospital, Crawley

Forth Valley Royal Hospital, Tayside, Scotland

Frimley Park Hospital, Frimley

Furness General Hospital

George Eliot Hospital, Nuneaton

Glan Clwyd Hospital, Rhyl

Glasgow Royal Infirmary

Gloucestershire Royal Hospital

Good Hope Hospital Sutton Coldfield

Harrogate District Hospital

Hillingdon Hospital

Hinchingbrooke Hospital

Homerton University Hospital

Huddersfield Royal Infirmary

Hull Royal Infirmary

Ipswich Hospital

James Paget University Hospital, Great Yarmouth

Kettering General Hospital

King's College Hospital, London

King's Mill Hospital, Sutton-in-Ashfield

Kingston Hospital

Leicester Royal Infirmary

Leighton Hospital, Crewe

Lincoln County Hospital

Lister Hospital, Stevenage

Luton and Dunstable University Hospital

Manor Hospital Walsall

Medway Maritime Hospital, Gillingham

Milton Keynes University Hospital

Morriston Hospital, Swansea

Musgrove Park Hospital, Taunton

New Cross Hospital, Wolverhampton

Newham University Hospital

Ninewells Hospital, Dundee

Norfolk and Norwich University Hospital

North Middlesex University Hospital

Northampton General Hospital

Northern Campus (Northern General Hospital), Sheffield

Northumbria Specialist Emergency Care Hospital, Cramlington

Northwick Park Hospital, London

Pinderfields Hospital, Wakefield

Princess Alexandra Hospital, Harlow

Princess of Wales Hospital, Bridgend

Queen Alexandra Hospital, Portsmouth

Queen Elizabeth Hospital, Gateshead

Queen Elizabeth Hospital Birmingham

Queen Elizabeth Hospital Greenwich

Queen's Hospital Burton-on-Trent

Queen's Medical Centre, Nottingham

Raigmore Hospital, Inverness

Royal Alexandra Hospital, Paisley

Royal Berkshire Hospital, Reading

Royal Bolton Hospital

Royal Bournemouth Hospital

Royal Cornwall Hospital

Royal Derby Hospital

Royal Free Hospital, London

Royal Glamorgan Hospital, Llantrisant

Royal Hallamshire Hospital, Sheffield

Royal Hampshire County Hospital, Winchester

Royal Infirmary of Edinburgh

Royal Lancaster Infirmary

Royal Liverpool University Hospital

Royal Oldham Hospital

Royal Preston Hospital

Royal Shrewsbury Hospital

Royal Surrey County Hospital, Guildford

Royal United Hospital, Bath

Royal Victoria Hospital, Belfast

Royal Victoria Infirmary, Newcastle

Salford Royal Hospital

Salisbury District Hospital

Sandwell General Hospital, Birmingham

South Tyneside District Hospital, South Shields

Southampton General Hospital

Southend University Hospital

Southmead Hospital, Bristol

Southport & Formby District General Hospital

St. George's University Hospital, London

St. James's University Hospital, Leeds

St. Mary's Hospital Isle of Wight

St. Mary's Hospital, Paddington, London

St. Thomas' Hospital, London

Stoke Mandeville Hospital

Sunderland Royal Hospital

Tameside General Hospital, Glossop

The Grange University Hospital, Cwmbran

The Great Western Hospital, Swindon

The Horton General Hospital, Banbury

The James Cook University Hospital, Middlesborough

The John Radcliffe Hospital, Oxford

The Queen Elizabeth Hospital, King's Lynn

The Queen Elizabeth University Hospital, Glasgow

The Royal London Hospital, London

The Ulster Hospital, Belfast

The Whittington Hospital, London

The York Hospital

Torbay Hospital, Torquay

University College Hospital, London

University Hospital Coventry

University Hospital Crosshouse

University Hospital Llandough

University Hospital of North Durham

University Hospital of North Tees, Stockton-on-Tees

University Hospital Wishaw

Victoria Hospital, Kirkcaldy

Warrington Hospital

Warwick Hospital

Watford General Hospital

West Middlesex University Hospital, London

Western Isles Hospital, Stornoway

Whipps Cross University Hospital, London

Whiston Hospital, Prescot

Wrexham Maelor Hospital

Wycombe Hospital, High Wycombe

Wythenshawe Hospital, Manchester

Yeovil Hospital

Ysbyty Gwynedd, Bangor

Participated but had no cases to audit

Airedale General Hospital, Keighley

Barnet Hospital, London

Macclesfield Hospital

Maidstone Hospital

Manchester Royal Infirmary

Queen Elizabeth The Queen Mother Hospital, Margate

Queen's Hospital, Romford

University Hospital, Lewisham

Did not participate (NOTE: Hospitals highlighted in red originally enrolled but then resigned

Alexandra Hospital, WHERE

Ashford Hospital

Basildon University Hospital

Bassetlaw Hospital

Belfast City Hospital

Blackpool Victoria Hospital

Bronglais General Hospital, Aberstwyth

Broomfield Hospital, Chelmsford

Calderdale Royal Hospital, Halifax,

Chase Farm Hospital, London

Clatterbridge Hospital, Wirral

Conquest Hospital, St. Leonards-on-Sea

County Hospita,l Hereford

Craigavon Hospital, Portadown

Daisy Hill Hospital, Newry

Diana, Princess of Wales Hospital, Grimsby

Eastbourne Hospital

Epsom Hospital

Fairfield General Hospital, Bury

Friarage Hospital, Northallerton

Glangwili General Hospital, Carmarthen

Glenfield Hospital, Leicester

Goole and District Hospital

Grantham and District Hospital

Kent and Canterbury Hospital

King George Hospital, Goodmayes

Leicester General Hospital

Manchester Orthopaedic Centre (at Trafford General)

Neath Port Talbot Hospital

Noble's Hospital, Isle of Man

North Devon District Hospital, Barnstaple

North Manchester General Hospital

Peterborough City Hospital

Pilgrim Hospital, Boston

Poole Hospital

Prince Charles Hospital, Merthyr Tidfil

Prince Philip Hospital, Llanelli

Princess Royal University Hospital, Farnborough

Rochdale Infirmary

Rotherham Hospital

Royal Albert Edward Infirmary, Wigan

Royal Blackburn Teaching Hospital

Royal Devon and Exeter Hospital

Royal Marsden Hospital, Chelsea

Royal Marsden Hospital, Sutton

Royal Stoke University Hospital

Royal Sussex County Hospital, Brighton

Russells Hall Hospita,l Dudley

Scunthorpe General Hospital

Singleton Hospital, Swansea

South West Acute Hospital, Eniskillen

St. Bartholomew's Hospital, London

St. Helier Hospital, Epsom

St. Mary's Hospital, Manchester

St. Peter's Hospital, Ashford

St. Richard's Hospital, Chichester

Stepping Hill Hospital, Stockport

The Princess Royal Hospital, Haywards Heath

Trafford General Hospital

University Hospital, Ayr

University Hospital, Hairmyres

University Hospital of Hartlepool

University Hospital of Wales, Cardiff

West Cumberland Hospital, Whitehaven

West Suffolk Hospital, Bury St. Edmunds

Weston General Hospital, Weston-super-Mare

William Harvey Hospital, Ashford

Withybush General Hospital, Haverfordwest

Worcestershire Royal Hospital

Worthing Hospital

Wrightington Hospital

Appendix Two – List of contributors

Hospital Name	Consultant Gastroenterologist OR Lead endoscopist	Clinical Audit Lead	Auditors & n cases	
Aberdeen Royal Infirmary	Lindsay McLeman	Maciej Adler		113
Addenbrooke's Hospital	Gareth Corbett	Ahmed Feroz	Abdul Hameed Rahini; Ahmad Hassan; Catherine Katabira; Dunecan Massey; Madilia Muhammad Farooq Mirza; Mohammad Choudhury; Nyo Lai Yee Win; Syad Ali Bilal Hassan.	71
Aintree University Hospital	Neil Kapoor	Doug Penman		34
Altnagelvin Area Hospital	Charles Ferguson	Ciaran Francis Magee		1
Arrowe Park Hospital	Adrian Thuraisingham	Nikki Summers	Ioannis Papamargaritis; James Colclough; Joseph Parsons.	41
Barnsley Hospital	Elmuhtady Said	Thomas Archer	Alex Calderbank; Elmuhtady Said; Ali Mahdi; Imran Ahmad; Kimberley Monks; Martha Ellis; Matt Hughes; Raaid Jamil; Rusyai Zalynda.	43
Basingstoke & North Hampshire Hospital	Mike Reynolds	Chinonso Nwoguh		25
Bedford Hospital	Jacqelyn Harvey	Sim Yee Lim		35
Birmingham Heartlands Hospital		Muhammad Azhar Hussain	Hurooul Aain; Krithi Shamanur; Nahid Hassan; Preethi George Pandeth.	89
Borders General	Jonathan Fletcher	Daniel Lynch	Amir Khan	29

Bradford Royal Infirmary	Sulleman Moreea	Sarah Jowett	Imran Iqbal; Jade Palmer; Kameel Khan; Mahmoud Bakr; Paramdeep Duggal; Sonia Moteea; Vandana Ruggoo.	57
Bristol Royal Infirmary	Jonathan Tyrell-Price	Hannah Donnelly	Lydia Neuberger; Molly Flint.	83
Caithness General Hospital	Marcin Szczepanski	Nils Fritsch		5
Causeway Hospital	Gaurav Manikpure	Edvard Volcek	Ajeet Kumar; Amrita Gurung; Gaurav Manikpure; Melissa Flynn; Olivia McConaghie; Phelim McPolin; Rajesh Veetil.	21
Charing Cross Hospital	Anet Soubieres	Aaron Bhakta		11
Chelsea & Westminster Hospital	Neerav Joshi	Neerav Joshi	Adham Chakhachiro; Dev Chatterjee; Emer Kilbride; Golnoush Seyedzenouzi; Pyei Aung; Richard Hackett; Utkarsh Ojha; Michael Carbonell.	20
Chesterfield Royal	Keith Dear	Mohsen Eldragini		23
Colchester Hospital	Ian Gooding	Theo Panagaris	Aye Phyo	40
Countess of Chester Hospital	Tristan Townsend	Junaid Akhtar	Craig Wyatt; Parmilan Gill; Reea Khanna; Samir Sulaiman; Tristan Townsend.	42
Croydon University Hospital	Sanjay Gupta	Michael Colwill		6
Cumberland Infirmary	Sherif Shabana	Mohamed Osman	Deborah Gibson; Paul McClymont; Sherif Shabana.	10
Darlington Memorial Hospital	Anjan Dhar	Danielle Rayner		2
Derriford Hospital	Fahd Baqai	Mohamed Waddah	Madina Mohamed; Mutaz Taha; Sabria Islam; Syed Aaquil Hasan Syed Javid Hasan.	42

Doncaster Royal Infirmary	Anthony Chappell	Abuajela Sreh	Chinyere Ochuba; Connor Cotton; Corrie Bowers; Daniel Camlfield; Maaz Nayyer; Matthew Taylor; Moaz Ahmad; Mohamed Ramadan; Sandip Samanta; Sarah Anderson; Thomas Lovering.	41
Dumfries & Galloway Royal Infirmary	Mathis Heydtmann	Moawad Mikayed Mohamed Abdelkader Mahgoub		18
Ealing Hospital	Sohail Shariq	Krishna Shah	Anna Marfin; Jessica Padley; Zahra Mohamedali	18
East Surrey Hospital	Matthew Cowan	Shi Jie Looi		63
Forth Valley Royal Hospital	Joanna Leithead	Joanna Leithead		59
Frimley Park Hospital	Thomas Shepherd	Imogen Sutherland & Elliott Taylor	Barath Baiju; Emily Cooper; Emir Lacevie; Hala El Tahir; Kelan Pascoe; Layla Ganjian; Rebecca Jurdon.	4
Furness General Hospital	John Keating	Ahmed Hamdy		16
George Eliot Hospital	Edmond Sung	Walid Mohammed Mujib Choudhary		12
Glan Clwyd Hospital	Aram Baghomian	Hamza Abdelrahim	Asad Baig	13
Glasgow Royal Infirmary	Adrian Stanley	Josh Palmer		102
Gloucester Royal Hospital	Coral Hollywood	Elinor Littlewood	Coral Hollywood; Robbie Adamson; Sophie James.	20
Harrogate District Hospital	Jon Harrison	Hannah Wynn		12
Hillingdon Hospital	Arun Rajendran	Charlotte Skinner		14
Hinchingbrooke Hospital	Anita Gibbons	Krithivasan Praman	Babangida Iliyasu Haruna; Chisom Nwanejuafor; Suhair Ashiq Ali.	24
Homerton Hospital	Laura Marelli	Nora Thoa		19

Huddersfield Royal Infirmary	Simon Gonsalves	Puneet Chhabra	Ahmed Rajab; Anuj Gandagule; Angela Matijevic; Ghalia Alia; Hunny Khurana; Jamal Al-Yousofi; Jeanne Babol; Maha Ejaz; Ndidamaka Offor; Shaista Hussain; Sion Roberts; Sophie Price; Sylvia Kinstler.	46
Hull Royal Infirmary	Anca Staicu	Anca Staicu		50
Ipswich Hospital	Hemant Laxaman	Obinna Onwuteaka		24
James Paget University Hospital	Rawya Badreldin	Zeshan Choudry		16
John Radliffe Hospital	Adam Bailey	Charis Manganis	Archie Lodge; Gaurav Nigam; Julia Pakpoor; Kitty Phillips; Mae Eales; Mo Dada; Solange Bramer; Caitlin Benham; Catherine Seymour; Catriona Phillips; Tabitha Gould.	96
Kettering General Hospital	Amr Eldahshan	Solange Serna	Ghayyur Khalil; Haider Mirza.	20
King's College Hospital	Debbie Shawcross	Hermon Amanuel	Abdul Samad; Fatima Shahid; M Mohamed; Saira Siddiqui.	23
Kingsmill Hospital	Stephen Foley	Mostafa Sherif el-Gindy		16
Kingston Hospital	Ralph Greaves	Ralph Greaves	Rachel Edwards	56
Leicester Royal Infirmary	Aye Aye Thi	Mohamed Shiha		40
Leighton Hospital	Naveen Mohandas	Joshua Muir		18
Lincoln County Hospital		Sharon Sinha		12
Luton & Dunstable University Hospital	Sophie Sinclair	Sophie Sinclair		64
Manor Hospital Walsall	Amanda Jane Hughes	Aniruddha Jog & Asif Yasin	Mehrab Rasheed	26

Medway Maritime Hospital	Gabor Sipas	Muneer Abbas	Hsuyadanar Aung; Khine-Zan Wai; Kulprasad Chongbang; Mohamed Ghanem; Pooja Devi.	55
Milton Keynes General Hospital	Ravi Madhotra	Arjun Prakash	Adeel Ahmad; Carmen Vlase; Martha Murdoch; Sania Mushtaq; Mohammed Shaheer Pandara Arakkal.	24
Morriston Hospital	Umakant Dave	Mesbah Rahman		17
New Cross Hospital	Andrew Veitch	Raheel Anjum		50
Newham University Hospital	Vasu Kulhalli	Swapnil Khose		21
Norfolk & Norwich University Hospital	Andrew Douds	Rahim Khan	Jessica Wong; John Thomas; Mie Thu Ko; Usama Aslam.	64
North Middlesex University Hospital	Debasis Majumdar	Lynn Affarah		16
Northampton General Hospital	Titus Thomas	Rohan Tariq	Mansur Mohammed; Sarath Kumar.	28
Northumberland Specialist Emergency Care Hospital	Tom Lee	Tom Lee		45
Northwick Park Hospital	Adam Haycock	Ali Al-Adhami		1
Pinderfields Hospital	Andrea Nicholls	Lewis Germain	B Naw R Aung Din; Majd Abusharar; Sam Murray.	47
Princess Alexandra Hospital	Mahmoud Ahmed Elsaid Elkaramany	Federica Merlini	Albert Egwele; Annette Nethersole; Jie Tong; Khadija Stone.	62
Princess of Wales Hospital	Clement Lai	Huw Thomas		10
Queen Alexandra Hospital	Pradeep Bhandari	Pradeep Bhandari		50
Queen Elizabeth Hospital Birmingham	Efe Ejenavi	Athesham Zafar	George Howell; Mehereen Murshed; Muhammad Javaid Iqbal.	53
Queen Elizabeth Hospital Gateshead	Raheel Qureshi	Raheel Qureshi		30

Queen Elizabeth Hospital Greenwich	Aathavaan Loganayagam	Rawan Al Soud	Brooke Smart; Charlotte Eden; James Dunn; Jonathan Curtis; Nitya Matcha.	42
Queen's Hospital Burton	Riaz Dor	Riaz Dor		20
Queen's Medical Centre	Martin James	Abhishek Sheth	Kristian Wild; Luis Machado; Martin James; Peter Eddowes; Samuel Dilks; Utkarsha Basu.	12
Raigmore Hospital	Alan Grant	Hamish Myers		32
Royal Alexandra Hospital Paisley	Inamul Mulhaq	Inamul Mulhaq		58
Royal Berkshire Hospital	Nishay Chandra	Kharishma Dhera	Chirag Gadhia; Farooq Chaudhary; James Kennedy; Jennifer Kent; Udani Mahamithawa; ZawMyo Aung.	37
Royal Bolton Hospital	Nick Wang	Katharine Teasdale	Isabella Girling; Peter McMahon; Kimberley Butler; Shabbir Jivanjee.	39
Royal Bournemouth Hospital	Jo Tod	Muhammad Asad	Hassan Sherif; Liam Evans; Sian Meldrum.	63
Royal Cornwall Hospital	Keith Sau	Joel James	Arran Williamson; Cisel Boyuegri; Eimon Khine; Joy Worthington; Khine Thu; Mohammad Ghannam; Monica Andrawes.	8
Royal Derby Hospital	Said Din	Muhammad Nasim	Emily Tucker; Faisal Baig; Islam Mubashwirul; Mohammed AlShawwaf; Rachel Lai.	39
Royal Free Hospital	Jonathan Potts	Alexander Hung		34
Royal Glamorgan Hospital	David Samuel	Darrien Henry	Aneet Kumar; Ben Bridgewater; Ben Pyrke; David Purchase; Eugene	37

			Er; Lilian Lau; Richard Vaughan; Rosie McDonald.	
Royal Hampshire County Hospital	Corrine Brooks	Melissa Zhao		18
Royal Infirmary of Edinburgh	Nick Church	Paul Brennan		8
Royal Lancaster Infirmary	John Keating	Julia Moradi		43
Royal Liverpool University Hospital	Andrew Moore	Michelle Sherwin		80
Royal Oldham Hospital	Anirudh Bhandare	Anirudh Bhandare		65
Royal Preston Hospital	Michael Finegan	Khurram Bin Raees	Lara Satter; Muhammad Aneeb Sabir; Rayhan Gasiea; Shazaib Shahzad.	37
Royal Shrewsbury Hospital	Mohamed Mohyeldin Mahgoub	Wail Mostafa		41
Royal Surrey County Hospital	Kallilopi Alexandropoulou	Abhishek Ray	Conor McManaman; Giriraj Raderam; Henry Eynon-Lewis; Khai Leow; Maja Kaladjiska.	13
Royal United Hospital	John Saunders	Laura Backhouse		40
Royal Victoria Hospital Belfast	Inder Maine	Andrew Spence		33
Royal Victoria Hospital Newcastle	Chris Mountford	Jamie Catlow		50
Salford Royal Hospital	Clare Omerod	Andrew Wong		10
Salisbury District Hospital	Ali Samar	Prashant Dwivedi	Amir Liaqat; Lujan Hassan; Maryam Nasim.	32
Sheffield Teaching Hospitals	Alex Ball	Victoria Knott	Al-Hassan Ghodief; Emily Fenner; Jo Buck; John Finnen; Khubaib Malik; Lizzie Peat; Mollie Canavan; Rusyai Ramli; Scarlett Strickland; Thiri Myat; Uzma Asraf; Waleed Ahmed.	25
South Tyneside District Hospital	Rohit Sinha	Sarah Manning		24

Southend University Hospital		Sharoz Rabbani	Amal Najdawi; Ioannis Koumoutsos; Manal Mamoun; Mehul Amin; Muhammad Khan; Namg Ngin Hom; Rifat Ershad; Win Lae Lae Aung; Wint Wah Oo; Sarala Janarthan.	34
Southmead Hospital	Zeino Zeino	Claire Hannon	Jacqueline Roy	39
Southport & Formby District General Hospital	Mike Roberts	Mike Roberts		24
St. George's Hospital	Jamal Hayat	Gareth Sadler	Basil Ahmad; Joseph Cooney.	11
St. James University Hospital	Ruchit Sood	Kalyan Peddada	Arif Atique; Ben Wildgoose; Hicham Daadaa; Mahmud Elomrani; Muhammad Taha Khan; Yaseer Khan; Ethar Abd Al Shakour.	29
St. Mary's Isle of Wight		Julie Parrack		13
St. Mary's Paddington	Lakshmana Ayaru	Stephanie Poo	Anushkumar Vasireddy; Joanna Meng; Jodie Russell; Lakshmana Ayaru; Madelaine Graydon; Thomas Rassam; Varun Nadkarni; Woon Senn Koh; Yuri Im.	67
St. Thomas' Hospital	Jason Dunn	Mandour Omer		28
Stoke Mandeville Hospital	David Gorard	Mohamed Ibrahim		9
Sunderland Royal Hospital	Rohit Sinha	Khurum Kakeem & Dominic Maxfield	Alastair Coulson; Lois McMaster.	50
The Great Western Hospital	Manish Hegde	Rebecca Anderson		23
The Horton General Hospital	Rebecca Palmer	Jessiya Veliyankodan Parambil	Jenny Tempest-Mitchell; Angad Ryatt.	13
The James Cook University Hospital	John Greenaway	Alaa Mohamed Ali		46
The Queen Elizabeth Hospital King's Lynn	Shailesh Karanth	Shailesh Karanth		24
The Queen Elizabeth	Jude Morris	Emily Brownson		119

University Hospital Glasgow				
The Ulster Hospital	Tony Tham	Rebecca O'Kane		30
The Whittington Hospital	Sheena Mankodi	Clive Onnie		13
The York Hospital	Prashant Kant	Najeeb Ullah Khan		56
Torbay Hospital	James Neale	Amin Abdulgader		64
University College Hospital		Mohamed Hussein		9
University Hospital Coventry	Ben Disney	Katherine Arndtz		57
University Hospital Crosshouse	Kevin Robertson	Caroline McCloskey		14
University Hospital Llandough	Hasan Haboubi	Hasan Haboubi		3
University Hospital North Durham	Deepak Kejariwal	Danielle Rayner		19
University Hospital North Tees	Iosif Beintaris	Darikha Senanayake		51
University Hospital Wishaw	Marc Cram	Alexander Grayston		1
Victoria Hospital Kirkcaldy	Katharine Pollock	Vaishali Ranade	Lucy Arrowsmith; Naomi Gunn.	36
Warrington & Halton Hospital	Sundaramoorthy Bharathi	Anish John Kuriakose Kuzhiyanjal	Charlotte Eaton-Hart; Divya Bhimireddy; Sabrina Pamela Sookramanien; Alison Kemp; Jaiganesh Mohan.	18
Warwick Hospital	Ben Lee	Voon Kune Lim	Joshua Bower	36
Watford General Hospital	Mark Fullard	Mark Fullard	Paul Wolfson	3
West Middlesex University Hospital	Georgina Chadwick	George Hiner		22
Western Isles Hospital		Fraser Brooks		4
Whipps Cross University Hospital	Sami Hoque	Danujan Sriranganathan		20
Whiston Hospital	Vanessa Theis	Vanessa Theis	Cynthia Srikanathan; Emma Berryman; David McClements; Emily Wooley.	79
Wrexham Maelor Hospital	Duncan Stewart	Will Thompson	Jack Barrington; Kasthuri Nallathamby; Samuel Thomas; Shaarven Kumar Jayachanra	49

			Moorthy.	
Wycombe Hospital	David Gorard	Mohamed Ibrahim		17
Wythenshawe Hospital	Dipesh Vasant	Ayodele Sasegbon		20
Yeovil Hospital		Fatima Elamin		13
Ysbyty Gwnedd	Jonathan Sutton	Jonathan Sutton		16