NHS
Blood and Transplant

2025 Audit of Compliance with Major Haemorrhage Protocols

National Comparative Audit of Blood Transfusion

February 2026

Acknowledgements

We wish to thank all those who have participated in the 2025 audit of the management of major haemorrhage. This audit would clearly not be possible without their support. We are equally grateful to many colleagues for their valuable and constructive comments.

We would also like to acknowledge the invaluable support and assistance provide by the team at SHOT.

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We are grateful to the following for their assistance in piloting the audit:

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Our thanks also go to Tanya Hawkins, Royal Berkshire Hospital, for her valuable insights.

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Summary and Recommendations* (*See also Full Recommendations as Appendix D)

3792 cases of Major Haemorrhage Protocol (MHP) activation / major bleeding were audited from 186 hospitals.

STANDARD	Key findings	Recommendations
1: Major haemorrhage protocols (MHPs) – availability and activation MHPs include a clear mechanism for contacting all relevant team members and support staff.	100% of sites have an MHP 67% (115/172) of sites have a separate paediatric MHP Variation in activation methods including: 2222 (120/172, 72%), another emergency number (13/172, 12%), a direct call to the lab (34/172, 20%) 53% (63/120) of sites using 2222 also require a separate call to the lab 5% (17/132) of Trusts with multiple sites have different activation methods across sites	Key stakeholders from both laboratory and clinical areas should be involved in the design of the MHP The activation method of the Major Haemorrhage Protocol needs to be clearly stated in trust induction and any clinical training Regular reminders and training should reinforce the MH activation method
2: Training and education of staff Clinical staff involved in frontline care are trained to recognise major blood loss early, are familiar with the contents of MHPs and know when to activate and de-activate the local MHP.	MHP was activated in 96% (3640/3792) of cases and activation was in line with the organisation's MHP 93% of the time (3394/3640) MHP was 'stood down' in 54% (2042/3792) 54% cases MH simulation training or drills were carried out in 86% (148/172) of sites 16% (23/148) do these less than once per year and 39% (58/148) only annually 67% (99/148) involve both laboratory and clinical staff 77% (133/172) of sites audit MHP activations but 33% (44/133) only do this annually or less frequently	Major Haemorrhage training should include the activation and stand down procedures

3: Emergency red cells Strategies are in place to ensure that: Emergency blood components are readily available for treatment of life-threatening bleeding, including prompt access to group O RBC as emergency stock. Group O RhD- and K-negative RBCs are prioritised for females of childbearing potential (aged<50 years) and in patients whose sex is unknown.	83% (142/172) of sites have a policy for issuing group O positive units to male patients and female patients over the age of 50 years 32% (43/133) of sites with remote blood fridges have them stocked with both O negative and O positive emergency RBC units Of 924 male patients receiving emergency group O, 412 (45%) received O negative 99% (170/172) of sites include the need to send a group and screen sample in their MHP In 25% of the cases where group specific blood was not issued (232/875), this was due to sampling problems: no sample (21%, 183/875), insufficient (1%, 6/875) or rejection (4%, 34/875) The median time from MHP activation to the release of RBC was 4 minutes, from release to collection 4 minutes and from collection to use 10 minutes. The overall median time from MHP activation to first RBC unit transfused was 20 minutes The median time to receipt of patient's own blood type was 52 minutes	Sites with policy for use of group O positive for males/ females of non-childbearing potential should explore how these can be stocked in remote blood fridges Staff training/ drills should include the importance of sending group and screen samples and the appropriate use of group O
4: Policies for rapid release of other components/ products Policies and procedures cover the rapid release of blood components and products for major haemorrhage including the reversal of anticoagulants	72% (124/172) of sites include guidance on reversal of anticoagulation in their MHP 16% (607/3792) of patients were on some form of anticoagulation Where those patients received haemostatic agents, 90% (327/364) were in line with local guidelines 26% (45/172) of sites keep pre-thawed FFP for major haemorrhage. Only 12 keep this in remote fridges The median time from MHP activation to FFP release was 27 minutes	Sites should have a local protocol for anticoagulation reversal, either included within or signposted from the MHP. This must be readily accessible, especially to teams in the emergency department

5: Component Ratios If major bleeding is on-going and results of standard coagulation tests or near-patient tests are not available, FFP is transfused in at least a 1:2 ratio with units of RBCs (1:1 ratio in traumatic haemorrhage)	In patients receiving >4 units of RBCs where no clotting tests were performed, 64% (155/241) were transfused FFP in at least a 1:2 ratio with RBCs In patients with traumatic haemorrhage, 39% (160/415) were transfused FFP in a 1:1 ratio with RBCs	Training/ drills should cover appropriate plasma component ratios and the rationale for these
6: Tranexamic Acid (TxA) TxA is recommended within 3 hrs of the onset of major bleeding but not recommended in gastrointestinal bleeding	69% (2350/3792) of patients had documentation of receiving TxA Where TxA was not given, there was an appropriate documented reason in 60% (820/1369) of cases The median time to TxA administration was 31 minutes. 22% (212/954) of patients received TxA within 10 minutes of MHP activation. 14% (140/954) of patients received TxA >3 hours after onset of bleeding 36% (273/769) of patients with GI bleeding were given TxA	MHPs should state that TxA is not routinely recommended in GI bleeding MHPs should state that TxA should not be commenced >3 hours after onset of bleeding
7: Haemostatic testing Haemostatic (clotting) tests are performed to guide and ensure the appropriate use of haemostatic blood components Where Viscoelastic Haemostatic Assays (VHAs) [TEG/ ROTEM] are in use, policies are in place to maintain these	In patients transfused with FFP or cryoprecipitate, 73% (1204/1650) had haemostatic tests sent. 66% (791/1204) were conventional laboratory coagulation tests, 20% (238/1204) point of care Viscoelastic Haemostatic Assays (TEG/ ROTEM) and 14% (166/1204) had both In patients receiving >4 units of RBC, haemostatic tests were sent in 79% (502/636) 58% (100/172) of sites use VHAs to guide transfusion therapy. 78% (78/100) have a policy in place for their use and maintenance Only 24% (24/100) of sites have their VHA devices interfaced with other electronic systems: EPR at 11, LIMS at 4 and both EPR and LIMS at 9	Training/drill feedback should include review of haemostatic testing mentioned, and whether this aligns with local policy/ test availability VHA devices should interface with EPR/LIMS for governance, documentation and to reduce transcription errors. Where this is not possible, the clinical risk should be assessed and documented

Background

Major haemorrhage is a time-critical medical emergency that requires the rapid delivery of blood components and coordinated responses from both clinical and laboratory teams. Despite the presence of national guidelines and the widespread implementation of Major Haemorrhage Protocols (MHPs), delays in transfusion continue to result in preventable deaths and serious morbidity. SHOT (Serious Hazards of Transfusion) reports have repeatedly identified transfusion delays as a significant and avoidable cause of harm.[1] These delays are frequently linked to failures in early recognition of bleeding, communication breakdowns between clinical and laboratory teams, and failure to activate the MHP.

In recognition of this ongoing risk, a Central Alerting System (CAS) safety notice was issued in 2020, urging all NHS organisations to strengthen the governance, training, and audit of their major haemorrhage response.[2] However, despite this alert, the number of delays associated with MHPs continues to rise. This has prompted a renewed national focus on not just whether hospitals have protocols in place, but how effectively those protocols function in real time.

This 2025 National Comparative Audit of the Management of Major Haemorrhage is a repeat of the original 2018 national audit, but with a sharpened focus on the practical aspects of MHP implementation. While the 2018 audit confirmed that almost all hospitals had an MHP, it revealed inconsistencies in laboratory support, underuse of coagulation testing, suboptimal administration of tranexamic acid, and inadequate audit and stand-down procedures.[3] It also showed that many hospitals had just one Biomedical Scientist (BMS) available out of hours, despite the fact that the majority of major haemorrhage cases occurred during these periods.

This repeat audit is designed not only to measure progress since 2018 but to understand the operational elements that impact MHPs. This audit aims to benchmark national practice and provide valuable insights to drive meaningful improvements in the management of MHPs.

Aims of the audit

Assess the configuration of services and the governance around major haemorrhage nationally

Evaluate the activation and operation of the Major Haemorrhage Protocol (MHP)

Assess the appropriateness and timeliness of blood component provision and administration

Audit Standards

The standards from this audit were derived from the recommendations in the British Society of Haematology (BSH) guideline: Haematological management of major haemorrhage.[4] Other benchmarks used included the National Patient Safety Alert: Preventing transfusion delays in bleeding and critically anaemic patients.[2]

Standard 1: Major haemorrhage protocols (MHPs) – availability and activation

MHPs include a clear mechanism for contacting all relevant team members and support staff.

Standard 2: Training and education of staff

Clinical staff involved in frontline care are trained to recognise major blood loss early, are familiar with the contents of MHPs and know when to activate and de-activate the local MHP.

Standard Statement 3: Emergency red cells

Strategies are in place to ensure that:

- Emergency blood components are readily available for treatment of life-threatening bleeding, including prompt access to group O RBC as emergency stock.
- Group O RhD- and K-negative RBCs are prioritised for females of childbearing potential (aged<50 years) and in patients whose sex is unknown.

Standard 4: Policies for rapid release of other components / products

Policies and procedures cover the rapid release of blood components and products for major haemorrhage including the reversal of anticoagulants.

Standard 5: Component Ratios

If major bleeding is on-going and results of standard coagulation tests or near-patient tests are not available, FFP is transfused in at least a 1:2 ratio with units of RBCs (1:1 ratio in traumatic haemorrhage).

Standard 6: Tranexamic Acid (TxA)

TxA is recommended within 3 hours of the onset of major bleeding but is not recommended in gastrointestinal bleeding.

Standard 7: Haemostatic testing

Haemostatic (clotting) tests are performed to guide and ensure the appropriate use of haemostatic blood components.

Where Viscoelastic Haemostatic Assays (VHAs) [TEG/ ROTEM] are in use, policies are in place to maintain these.

Methods

All NHS sites in England, Northern Ireland, Scotland and Wales, and independent hospitals that manage major haemorrhage, were invited to enrol in the audit.

Data were collected using a recent retrospective approach, since a fully retrospective approach was unlikely to yield all the data we were trying to collect. The time period covered was April to June 2025. The audit sample was all patients, including those aged under 16 years, for whom the MHP was activated, and also patients receiving large numbers of components when the MHP was not activated. The suggested definition of major haemorrhage was 5 units of RBC in 4 hours and/or 10 RBC in 24 hours, but sites could apply their own criteria in line with local practice. The target number of patients was 40 per site, although there was no minimum sample.

In addition to collecting data on how major haemorrhage management followed the local protocol, we also asked sites to provide organisational data to allow us to set practice within the context of local care delivery. The organisational questionnaire can be found in Appendix B. Sites could opt to respond either as a single hospital, or a collection of hospitals managed by a Trust or a Board, depending on local arrangements for managing any major haemorrhage.

Organisational Survey (n=172)

172/210 (82%) sites returned an organisational survey.

Does your organisation have a major haemorrhage protocol (MHP)?

Yes	172 (100%)

Does your hospital have a separate MHP for:

N=172	**Yes**	**No**	**Not stated / Not applicable**
Paediatrics	116 (67%)	49 (28%)	7 (4%)
Obstetrics	93 (54%)	72 (42%)	7 (4%)
Trauma	49 (28%)	106 (62%)	17 (10%)
Cardiac	13 (8%)	60 (35%)	99 (58%)

How is the MHP activated in your hospital? (e.g. 2222 or another emergency number)

N=172	Number of responses
Emergency number 2222	120
Direct contact with the laboratory	34
Alternative emergency number (e.g. 4444)	13
Bleep	5

NB. Some sites had more than one method of activation

Is the activation of the MHP the same process used across all sites in your Trust?

N=172	
Yes	118 (69%)
No	17 10%)
We only have 1 site	37 22%)

For sites using 2222 (n = 120), does the MHP require a separate phone call to the laboratory?

Yes	63 (52%)
No	57 (48%)

Does the MHP detail the concessionary, rapid release of the best matched red blood cells for patients with red cell antibodies?

N=172	
Yes	110 (64%)
No	60 (35%)
Not stated	2 (1%)

Does the MHP include the rapid reversal of anticoagulants?

N=172	
Yes	124 (72%)
No	46 (27%)
Not stated	2 (1%)

Does the MHP state that Fibrinogen Concentrate should be used instead of Cryoprecipitate?

N=172	
Yes	39 (23%)
No	132 (77%)
Not stated	1 (1%)

If yes, which type of MHP does it cover: (Tick as many as apply)

N=94	
Obstetrics	29 (31%)
General (Medical/Surgical)	22 (23%)
Trauma	17 (18%)
Cardiac	14 (15%)
Paediatrics	12 (13%)

NB. Total exceeds 94 because sites were able to select more than one option

Does the MHP specify the need to send a G&S sample to the lab?

N=172	
Yes	170 (99%)
No	2 (1%)

Does your hospital have a policy for issuing group O positive units to males and to females who are over 50 years old?

N=172	
Yes	143 (83%)
No	27 (16%)
Not applicable	2 (1%)

Do you have remote blood fridges at your hospital?

N=172	
Yes	134 (78%)
No	38 (22%)

Are these fridges operated:

N=134	
Electronically (kiosk)	101 (76%)
Manually (paper based)	30 (22%)
Both	3 (2%)

Do you stock both O negative and O positive for units for emergency use in remote blood fridges?

N=172	
Yes	43 (25%)
No	95 (55%)
Not stated	34 (20%)

Is your hospital a major trauma centre?

N=172	
Yes	28 (16%)
No	144 (84%)

Do you keep pre-thawed FFP for use in MH?

N=172	
Yes	45 (26%)
No	127 (74%)

Where is this located?

N=45	
Laboratory	32 (71%)
Remote fridges	5 (11%)
Both locations	7 (16%)
Not stated	1 (2%)

Does your hospital use point of care testing (i.e. TEG/ROTEM) to guide transfusion therapy?

N=172	
Yes	100 (58%)
No	69 (40%)
Not stated	3 (2%)

Do you have a policy in place for its use and maintenance?

N=100	
Yes	78 (78%)
No	16 (16%)
Not stated	6 (6%)

Where is the point of care device located?

Theatres	74
Maternity	57
Emergency Department	19
ITU	15
Laboratory	8
Other/not stated	4

NB: Some sites have POCT in more than one location

Are they interfaced to existing electronic systems?

N=100	
Neither	75
EPR	11
Both	9
LIMS	4
Not stated	1

Does your hospital have cell salvage?

N=172	

Yes	153 (89%)
No	17 (10%)
Not stated	2 (1%)

Is cell salvage available 24 hours a day/7 days a week?

N=153	
Yes	111 (73%)
No	39 (25%)
Not stated	3 (2%)

Does your hospital conduct MH simulation/drills?

N=172	
Yes	148 (86%)
No	22 (13%)
Not stated	2 (1%)

How often does this training occur?

N=148	
Once a year	58 (39%)
More than twice a year	48 (32%)
Less than once a year	23 (16%)
Twice a year	16 (11%)
Doesn't involve TPs	2 (1%)
Not stated	1 (1%)

The training involves (select all options):

Training content (N=148)	**N sites whose training includes that content**
Processes for activation of major haemorrhage protocols	143 (97%)
Importance of communication	140 (95%)
Rapid access to blood components and products	132 (89%)
Recognition of bleeding	128 (86%)
Appropriate use of group O / switch to group specific	118 (80%)

NB. Sites were able to select more than one option

Does the training involve both laboratory and clinical staff?

N=148	

Yes	99 (67%)
No	49 (33%)

Which clinical areas are covered?

Clinical area	N sites whose training covers that clinical area
A&E / ED	97
Maternity	93
Wards	48
Paediatrics	43
Theatres	36
Endoscopy	6
ICU	6

Does your hospital perform audits of the MH protocol?

N=172	
Yes	133 (77%)
No	39 (23%)

How often do these audits occur?

N=133	
More than twice a year	80 (60%)
Once a year	26 (20%)
Less than once a year	18 (14%)
Twice a year	6 (5%)
Not stated	3 (2%)

Clinical Findings

Information on 3792 patients received from 186 sites.

Breakdown	Sites	Patients audited
England	166	3469 (91%)
Northern Ireland	2	11 (1%)
Scotland	6	132 (3%)
Wales	10	159 (4%)
Ireland	2	21 (1%)
TOTAL	186	3792

How old was the patient?

	National (n)	National (%)
Child (<16)	91	2%
Adult under 50	1974	52%
Adult 50 or over	1687	44%
Not stated	40	1%

What was the patient's sex at birth?

	National (n)	National (%)
Female	2252	59%
Male	1454	38%
Not stated	86	2%

Where was the patient at the time of the major haemorrhage?

	National (n)	National (%)
A & E	1192	31%
Obstetric or Gynae ward	921	24%
Operating Theatre	700	18%
Medical ward	345	9%
Intensive Care Unit	164	4%
Surgical ward	162	4%
Pre-hospital	116	3%
Acute medical admissions unit	72	2%
Not stated	39	1%
Haematology/Oncology/Bone Marrow Transplant ward or day ward	29	1%
High Dependency Unit	24	1%
Recovery	16	<1%
Other; please state:	12	<1%

What was the nature of the major haemorrhage?

			Patients transfused	
Nature	**National (n)**	**National (%)**	*National (n)*	*National (%)*
Obstetric	1272	33%	*864*	*68%*
GI bleeding	777	20%	*739*	*95%*
Trauma	469	12%	*423*	*90%*
Medical	313	8%	*280*	*89%*
Gastrointestinal surgery	253	7%	*247*	*98%*
Other surgery	232	6%	*218*	*94%*
Gynaecology	204	5%	*186*	*91%*
Vascular surgery	109	3%	*102*	*94%*
Other; please state:	90	2%	*80*	*89%*
Cardiac surgery	68	2%	*63*	*93%*
Not stated	36	1%	*30*	*83%*
Unable to find information in the patient's records	8	<1%	*6*	*75%*

Note the total = 3831 because in some cases more than one option had been selected.

Was the patient on oral or parenteral anticoagulants at the time of the major haemorrhage?

	National (n)	National (%)
Yes	607	16%
No	2806	74%
Don't know	334	9%
Not stated	45	1%

If yes, what was the name of the anticoagulant(s)?

	National (n)	National (%)
Direct Oral Anticoagulant	265	44%
LMWH	232	38%
Warfarin	50	8%
Heparin	39	6%
Unknown	17	3%
Fondaparinux	4	1%

Was the MHP activated?

	National (n)	National (%)
Yes	3640	96%
No	117	3%
Not stated	35	1%

If yes, was the process of activation in line with your organisation's MHP?

	National (n)	National (%)
Yes	3394	93%
No	161	4%
Don't know	63	2%
Not stated	22	1%

The main reasons cited for incorrect activation/ failure to activate were:

- Use of an incorrect pathway (e.g. phoning lab directly on a standard line rather than using 2222 or a dedicated phone)
- Switchboard not passing on the call to the lab

- Clinical teams failing to follow up MHP activation with a call to lab to provide patient details/ blood requirements
- Clinicians phoning lab in advance of a formal MHP activation (by way of forewarning)
- Inappropriate use of the MH pathway to expedite blood provision or availability of porters, for a patient without massive bleeding
- Expected major bleeding in surgery managed with large volume transfusion but without formal MHP activation

Was the patient transfused with RBC?

	National (n)	National (%)
Yes	3203	84%
No	589	16%

Where was the first unit of RBCs collected from?

	National (n)	National (%)
The laboratory	2345	73%
Taken from a satellite fridge near to the clinical area	786	25%
Pre-hospital	40	1%
Not stated	32	1%

What was the blood group of the first unit of RBCs given?

	National (n)	National (%)
Emergency O negative	1013	32%
Emergency O positive	691	21%
The patient's own blood group	1449	45%
Not stated	50	2%

What was the blood group of the first unit of RBCs given for MALE patients

First unit of blood received	National (n)	National (%)
Emergency O negative	394	29%
Emergency O positive	489	37%
The patient's own blood group	452	34%

What was the blood group of the first unit of RBCs given for FEMALE patients aged 50 & over

First unit of blood received	National (n)	National (%)
Emergency O negative	199	33%
Emergency O positive	143	23%
The patient's own blood group	266	44%

If no RBC units of patient's own blood group were issued, why not? (n=875)

	National (n)	National (%)
No sample allowing blood to be issued was sent	183	21%
The sample sent was insufficient	6	<1%
The sample sent was rejected for another reason	34	4%
Patient's own group RBCs were not needed	515	59%
Not stated	137	16%

Did the patient receive any FFP for this major haemorrhage?

	National (n)	National (%)
Yes	1650	43%
No	2083	55%
Not stated	59	2%

Where was the first unit of FFP collected from?

	National (n)	National (%)
The laboratory	1497	91%
Taken from a satellite fridge near to the clinical area	114	7%
Other; please state:	33	2%
Not stated	6	<1%

For all patients: Were clotting tests taken

	National (n)	National (%)	Your Site (n)	Your Site (%)
Yes	1955	52%		
No	842	22%		
Not stated	995	26%		

If yes, how were they performed?

	National (n)	National (%)
Laboratory tests	1349	69%
Point of care tests	346	18%
Both	249	13%
Not stated	11	<1%

For patients transfused with FFP and cryoprecipitate, were clotting tests taken?

	National (n)	National (%)
Yes	1204	73%
No	414	25%
Not stated	32	2%

If yes, how were they performed?

	National (n)	National (%)
Laboratory tests	791	66%
Point of care tests	238	20%
Both	166	14%
Not stated	9	<1%

Where more than 4 units of RBC were received*, were clotting tests taken?

	National (n)	National (%)
Yes	502	79%
No	126	20%
Not stated	8	1%

**Used as a pragmatic means of defining a group with 'ongoing bleeding'*

Where at least 4 units of RBC were transfused AND clotting tests not done

	National (n)	National (%)
FFP transfused in at least a 1:2 ratio with RBC	155	64%
FFP transfused in less than 1:2 ratio with RBC	86	36%

Where patients presented with trauma

	National (n)	National (%)
FFP transfused in 1:1 ratio with RBC (or higher)	160	39%
FFP transfused in less than 1:1 ratio with RBC	255	61%

What is the total number of units of each component transfused for this major haemorrhage episode up until 24 hours after MHP activation (or 24 hours after start of bleeding if MHP was not activated)?

	Patients receiving			
No. of units	**RBC**	**FFP**	**Platelets**	**Cryoprecipitate**
0	524	1956	2891	3052
1 to 2	1482	769	538	329
3 to 4	982	556	53	61
5 to 6	350	120	11	22
7 to 8	160	87	3	5
9 or more	211	97	4	5
Not stated	83	207	292	318

Is there documented evidence that the haemostatic agents shown below were used in this major haemorrhage episode up until 24 hours after MHP activation (or 24 hours after start of bleeding if MHP was not activated)?

	rFVIIa	PCC	Vit K	Aprotinin
Yes	5 (<1%)	136 (4%)	182 (5%)	7 (<1%)
No	3707 (98%)	3570 (94%)	3520 (93%)	3665 (97%)
Not stated	80 (2%)	86 (2%)	90 (2%)	120 (3%)

Is there documented evidence that Tranexamic acid was used in this major haemorrhage episode up until 24 hours after MHP activation (or 24 hours after start of bleeding if MHP was not activated)?

	National (n)	National (%)
Yes	2350	62%
No	1388	37%
Not stated	54	1%

TXA use by nature of major haemorrhage	Yes	No	%Yes
Gynaecology	164	38	81%

Obstetric	1015	236	81%
Trauma	370	99	79%
Other surgery	161	67	71%
Cardiac surgery	33	34	49%
Gastrointestinal surgery	119	129	48%
Medical	146	164	47%
Surgical bleed	147	164	47%
Other; please state:	33	50	40%
GI bleeding	273	496	36%
Vascular surgery	36	70	34%
Unable to find information in the patient's records	2	8	20%

If Tranexamic acid was not given, why not?

	National (n)	National (%)
Clinically not appropriate		
GI bleed	562	40%
Other contraindication	27	2%
Futility	67	5%
Local protocol	3	<1%
Neonate	7	1%
Vascular	59	4%
Not a major bleed	84	6%
Logistical reasons		
Given elsewhere	4	<1%
Transferred	7	1%
Unable to assess (notes unavailable)	19	1%
No documented reason		
None	549	40%

Where haemostatic agents were given to patients on anticoagulants, was use within local guidelines?

	National (n)	National (%)
Yes	327	90%
No	37	10%

Was the MHP stood down?

	National (n)	National (%)	Your Site (n)	Your Site (%)
Yes	2042	54%		
No	1647	43%		
Not stated	103	3%		

Were there any delays or problems reported by the clinical area or laboratory in relation to this major haemorrhage?

	National (n)	National (%)
Yes	487	13%
No	3176	84%
Not stated	129	3%

We have performed a thematic analysis on problems reported. Six themes emerged: activation, communication, appropriate use, sampling, information technology and the ability to collect data for this audit.

THEME: Activation

CODES	Examples
Process not followed	MHP activated via phone call into the lab; rather than using the designated bleep number. Clinical teams are meant to phone lab upon MH activation to provide required details but this didn't happen Laboratory did not receive call from clinical area with patient details - caller did not stay on the line to be transferred to the laboratory Porter was sent without the lab being contacted first
Faults in activation process	Delay in declaring MH as staff did not know how to activate MHP even though there are posters in the clinical area and it is covered in mandatory training The lab did not receive the MH alert; the Tannoy system is faulty and not working in the lab area An 8-minute delay with switchboard connecting the call to the lab. Problems activation; phone call to the laboratory after switchboard activation delayed - problems with phone call infrastructure. MHP activated twice Bleeps did not go off; rapid porter was contacted directly by blood bank via switchboard to transport products.
Incorrect information provided	Voice over was for MH and not neonatal MH Porter sent to lab without patient ID MHP declared using wrong patient details. Lab was notified immediately; all components immediately returned to stock and fresh components issued.

THEME: Communication

CODES	Examples
Laboratory unable to reach clinical area	Unsure who the patient was; unable to identify which patient was requiring MH call; 5 extensions rung in ED Difficulty getting response from the extension number given took 7 minutes to answer Several communication issues to blood bank throughout MHP activation from clinical area. Included chasing amount of products required initially as line disconnected, chasing updates and asking if MH should be stood down
Change in circumstances	Change of name midway through haemorrhage Confusion as A&E activated the MHP; the patient was then taken for surgery and the operating theatres activated the MHP again RBC and FFP prepped and issued by the Lab and the clinical area did not tell the Lab that the patient was transferred to another hospital when lab rang the area Lack of communication from clinical team regarding transfer of patient.
Multiple teams involved	Unable to get hold of Haem consultant re use of beriplex Cardiac arrest call put out alongside Major Haemorrhage call. Porters actioned cardiac arrest call but not Major Haemorrhage so no porter was sent to lab to collect emergency components Radio in the Lab to contact the Porters was not working call to porter did not state where to report to - porter defaulted to emergency units but should have collected patient units from lab so was sent back to swap for patients group specific units
Traceability	No traceability tags sent back Traceability tag incorrectly filled out Transfusion documentation incomplete and one unit of cryoprecipitate remains untraced

THEME: Appropriate use of MHP

CODES	Examples
Activation with no blood used	Inappropriate MHP activation - no blood was required Called MH but stood down as soon as porter arrived so no blood administered No blood used; no blood ordered via the electronic system (Hb initially 173 g/L and dropped to 153 g/L)
Activation just to get blood rapidly	Activated just for urgent red cells. Happy to wait until patient grouped Use of MHP protocol to obtain urgent blood- not a MHP situation The patient was not actively bleeding at the time of MHP activation. The patient required a transfusion; and there was no valid group and screen available. It is presumed that the clinical team initiated a Massive Haemorrhage (MH) call in error; potentially due to the necessity of administering a blood transfusion
Component wastage	One unit emergency Oneg red cells and paperwork found on side in clinical area several hours after One unit returned many hours after collection - out of temperature control and wasted One unit of FFP wasted as thawed but not used
Inappropriate use of flying squad	Emergency O neg taken from satellite fridge when fully crossmatch compatible available. The clinical area continued using emergency units even after the crossmatched units have been issues and delivered to the blood fridge O neg RBC used when O pos should have been issued (male over 50)

THEME: Sampling

CODES	Examples
Delay in taking G&S	No 2nd G&S sample sent despite being asked repeatedly Group and save sample collected 5 hours after O neg units were transfused
Sample rejection	3 mislabelled samples sent to the lab No samples had been sent to the lab prior to the surgery. When samples sent for crossmatch there was a labelling error on one of the samples which had to be rejected and the patient rebled. Issues with patients' sample & labelling incorrectly. Could have issued on a name basis & not MHP if the ward/theatre had got the patient's name correct.

THEME: Information technology

CODES	Examples
System malfunction	One of the analysers was not functioning and the other analyser was not QC'd overnight which caused a delay of > 1 hr to process first sample sent On previous day LIMS underwent an upgrade. As a result; historical transfusion patient information was not available on the new LIMS for a number of days. Patient had a transfusion reaction to emergency O neg units used; probably due to a historical anti-Jk(a). X match labels would not print out Electronic tracking system did not recognise component when issued
Lack of familiarity with electronic systems	Error at kiosk when scanning out emergency Oneg - minor delay incurred Issues with typing in patient details into blood tack kiosk screen caused delays to accessing blood - Datix competed by clinical staff citing transfusion delay due to this Delays in administration due to new EPRR system

THEME: Data collection

CODES	Examples
Poor documentation	1st Unit of FFP documented as being given 2 minutes prior to its collection from lab No prescription of unit given FFP and blood transfusion was not recorded adequately on EPR Vitamin k advised to be given- could not find documented in the patients EPR record if this was administered Doses of TXA were definitely given; but the anaesthetic chart is chaotic and difficult to read so unable to decipher the actual times and doses
Multiple systems	Unable to include time administered as emergency units not issued to the named patient are not currently tracked on our electronic blood tracking system and rely on a paper form. LIMS updated when form received in lab so evidence it was transfused but physical form has been archived Drugs written on anaesthetic chart; not prescribed on the drug chart; doses and times of administration not clearly marked

Timescale analysis

Times excluded where:

- Time is >24 hours
- Time is before start time (e.g. used before collected)
- Missing dates/times

Red cells

RBC	Activation to Release		Release to Collection		Collection to Use		Activation to Own blood type		Activation to Use	
	N	%	N	%	N	%	N	%	N	%
≤10 mins	1637	80%	1680	73%	1308	48%	230	23%	409	16%
11-30 mins	273	13%	356	15%	1073	39%	161	16%	1291	52%
31-60 mins	78	4%	83	4%	204	7%	148	15%	499	20%
61-180 mins	46	2%	94	4%	124	5%	290	29%	225	9%
>180 mins	24	1%	103	4%	28	1%	164	17%	81	3%

Range (minutes)	Activation to Release	Release to Collection	Collection to Use	Activation to Own blood type	Activation to Use
Q1	1	1	5	11	12
Median	4	4	10	52	20
Q3	8	10	18	128	35

FFP

FFP	Activation to Release		Release to Collection		Collection to Use	
	N	%	N	%	N	%
≤10 mins	373	30%	835	62%	458	34%
11-30 mins	237	19%	253	19%	572	42%
31-60 mins	393	31%	106	8%	186	14%
61-180 mins	205	16%	83	6%	129	9%
>180 mins	47	4%	62	5%	14	1%

Range (minutes)	Activation to Release	Release to Collection	Collection to Use
Q1	7	1	8
Median	31	5	14
Q3	53	19	29

TxA

TxA	Activation to Use	
	N	**%**
≤10 mins	212	22%
11-30 mins	254	27%
31-60 mins	175	18%
61-180 mins	173	18%
>180 mins	140	15%

Comparison with 2018 National Comparative Audit of Major Haemorrhage

	2018	**2025**
MHP activated	81%	96%
MHP stood down	49%	54%
Haemostatic tests taken	55%	52%
Males >50 years transfused group O were given O negative	54%	45%
Females >50 years transfused group O were given O negative	85%	58%
Trauma patients received FFP:RBC in 1:1 ratio	35%	39%
Patients with ongoing bleeding received FFP:RBC in at least a 1:2 ratio	64%	64%
Patients given tranexamic acid • Trauma: • Obstetrics: • All Surgery:	62% • 83% • 68% • 42%	69% • 79% • 81% • 52%

Discussion and Conclusion

This audit provides an extensive data set from 3792 patient across 186 hospitals, covering MHP activation in a range of clinical settings. It is notable that 15% of the patients received no red cell transfusion. Some of these represented inappropriate use of the MHP or rapid patient demise, but the majority were due to pre-emptive activation where bleeding was subsequently controlled. This was particularly seen in obstetrics where 32% of patients received no blood. The Obstetric Bleeding Strategy for Wales includes routine activation of the MHP where estimated blood loss is >1500ml.[5] This has been widely adopted in England, but it is clear from comments received during this audit that many laboratories were not aware of this practice. It is important that laboratory and clinical teams are involved in the design of MHPs and clinical transfusion pathways, to ensure that expectations, roles and responsibilities are clear.

Standard 1: Major haemorrhage protocols (MHPs) – availability and activation

MHPs include a clear mechanism for contacting all relevant team members and support staff.
While all sites have an MHP, specialty-specific MHPs are not universally adopted. In particular, only 67% have a dedicated paediatric protocol and 54% an obstetric protocol. While this might reflect the patient populations sites serve, these patient groups have specific needs in major bleeding and warrant dedicated protocols to help clinical teams to manage them optimally.
MHPs were activated in 96% of the cases reported during the audit period, with 93% of activations following the correct organisational procedure. However, there is marked variation nationally in the mode of MHP activation. While use of the 2222 emergency code was most common (72%), other emergency numbers (12%) and direct calls to the lab (20%) are also used. Some Trusts with multiple sites (5%) reported different activation methods at different hospitals. Of those using the 2222 number, 53% also require a separate call to the laboratory, and this was identified as a recurring omission during the cases audited. Sites should try to simplify and harmonise methods for MHP activation as far as possible. Medical staff rotate frequently, both within and between Trusts and in many clinical areas MHP activations are uncommon. This creates a risk that clinicians are unaware of how to activate their MHP. It is important that the activation method of the MHP is clearly stated in Trust induction and in clinical training. Regular reminders (e.g. a 6 or 12-monthly all-staff communication) could be used to reinforce this.

In line with data collected by SHOT, problems with operation of the MHP processes were frequently encountered in this national audit. Our thematic analysis identified issues with MHP activation, appropriate use, communication, information technology, sample-taking and record keeping as recurring issues. Sites are encouraged to reflect on any challenges identified in their own audited cases, and to include these in reporting to safety and governance committees.

Standard 2: Training and education of staff

Clinical staff involved in frontline care are trained to recognise major blood loss early, are familiar with the contents of MHPs and know when to activate and de-activate the local MHP.
MHP activation deviated from local protocol in 4% of cases audited. Common issues were use of incorrect phone numbers, failure to make a follow-up call to the laboratory and misuse of the MHP in scenarios without massive bleeding. The MHP was only ‘stood down’ in 54% of cases. When compared with the previous MH audit in 2018 (49%), this demonstrates a slight improvement, however this does highlight a need to ensure that de-activation of the MHP is included in MH training.

MH simulation training or drills are an effective way to expose staff to the practical aspects of the MHP, and to reinforce its correct operation in a way which remains memorable. While 86% of sites perform drills, 16% do these less than once per year and 39% only annually. In addition, only 67% involve both laboratory and clinical staff. This represents a missed opportunity to test the system end-to-end.
MH training should include the activation and stand down procedures. A full MH simulation should be carried out at least once a year, and include clinical areas where MH is uncommon. The full MH simulation should include all staff groups involved: clinical, laboratory and support (portering, switchboard). While inevitably only very few individuals can be directly included, the learning points should be widely disseminated - to all staff groups and across all clinical areas.

Standard Statement 3: Emergency red cells

Strategies are in place to ensure that:

- **Emergency blood components are readily available for treatment of life-threatening bleeding, including prompt access to group O RBC as emergency stock.**
- **Group O RhD- and K-negative RBCs are prioritised for females of childbearing potential (aged<50 years) and in patients whose sex is unknown.**

Red cells were transfused to 85% of patients, and in 53% the first component was emergency group O. 25% of these were collected from a remote fridge near to the clinical area and 73% were from the laboratory.
While 83% of sites have a policy for issuing group O positive units to male patients and female patients over the age of 50 years, only 32% of sites with remote blood fridges have them stocked with both O negative and O positive emergency RBC units. Of the 924 male patients receiving emergency group O, 412 (45%) received O negative. For women over 50 years, 58% of emergency group O transfused was D-negative. Although this indicates a significant gap between policy and practice, these figures do demonstrate an improvement in practice since the 2018 audit where 54% of males and 85% of females over 50 years received O negative units when O positive units could have been given. This demonstrates a promising move towards better compliance with this standard which is particularly pertinent given the ongoing pressures on national O negative bloodstocks. Sites with a policy for the use of group O positive for males/ females of non-childbearing potential should explore how these units can be stocked in remote blood fridges.
While the need to send a group and screen sample is included in almost all MHPs, in this audit there were 232 cases where failure to send a sample, or samples not meeting acceptance criteria prevented the switch to group specific blood. 20% of sites do not routinely cover G&S sampling and the appropriate use of group O in their MH drills, and this aspect should be included.
Overall, this audit provides a good level of assurance about the ready access to RBC for bleeding patients. The median time from MHP activation to the release of RBC was 4 minutes, from release to collection 4 minutes and from collection to use 10 minutes, totalling a medium time from MHP activation to first unit being transfused of 18 minutes. The median time to receipt of patient's own blood type was 41 minutes.

Standard 4 – Policies for rapid release of other components/ products

Policies and procedures cover the rapid release of blood components and products for major haemorrhage including the reversal of anticoagulants.
16% of patients in this audit were taking some form of anticoagulation. This did include a significant number on low molecular weight heparin, which is likely to be predominantly thromboprophylaxis given

to in-patients, and may have little contribution to bleeding risk. However, the largest group (44%) were those receiving direct oral anticoagulants (DOACs).72%) of sites include guidance on reversal of anticoagulation in their MHP. Many individual patient factors influence whether specific reversal of anticoagulation is appropriate. In the patients audited here, where haemostatic agents were given, 90% were in line with local guidelines.
FFP was transfused to 44% of patients. 26% of sites report keeping pre-thawed FFP for major haemorrhage, though only 12 keep this in remote fridges. In this audit, 91% of FFP units were collected from the laboratory and just 7% from a remote fridge. The median time from MHP activation to FFP release was 27 minutes, and median time to transfusion was 46 minutes.

Standard Statement 5: Component Ratios

If major bleeding is on-going and results of standard coagulation tests or near-patient tests are not available, FFP is transfused in at least a 1:2 ratio with units of RBCs (1:1 ratio in traumatic haemorrhage).
The evaluation of this standard was performed using data collected on those patients who had received more than 4 units of RBC as this would define the group who genuinely had major haemorrhage. Where patients received more than 4 units of RBC and no clotting tests were performed, 64% received FFP in at least a 1:2 ratio with RBC.
In the setting of trauma, guidelines recommend a 1:1 ratio of FFP:RBC in initial resuscitation. 39% of patients with traumatic haemorrhage met this standard. This compares to 35% in the 2018 audit. Use of standardised major haemorrhage 'packs' containing pre-specified ratios of components can help laboratories anticipate demand and clinicians to keep up with plasma component requirements.

Standard Statement 6: Tranexamic Acid (TxA)

TxA is recommended within 3 hours of the onset of major bleeding but is not recommended in gastrointestinal bleeding.
Overall, 69% of patients had documentation of receiving TxA, though a number of auditors reported having difficulty finding this information in case notes. Where TxA was not given, there was an appropriate documented reason such as a clinical contraindication, patient deterioration or cessation of bleeding in 60%. The median time to TxA administration was 31 minutes, with 22% of patients receiving TxA within 10 minutes of MHP activation. However, 14% of patients received TxA more than 3 hours after onset of bleeding. Use of TxA was highest in traumatic (79%), obstetric (81%) and surgical bleeding (52%), which are the settings with the strongest evidence base. Compared to the 2018 audit, there has been an encouraging increase in use of TxA in the obstetric (68% in 2018) and surgical (42% in 2018) settings. It is notable that 36% of patients with gastrointestinal (GI) bleeding were given TxA, where it is no longer routinely recommended. MHPs should define the appropriate use of TxA, and this should also be covered in drills, particularly in areas (e.g. medical wards) where GI bleeding is more likely to be encountered.

Standard Statement 7: Haemostatic testing

Haemostatic (clotting) tests are performed to guide and ensure the appropriate use of haemostatic blood components.
Where Viscoelastic Haemostatic Assays (VHAs) are in use, policies are in place to maintain these.
In patients transfused with FFP or cryoprecipitate, 73% had clotting tests sent. 66% had conventional coagulation tests sent to the laboratory, 25% point of care viscoelastic haemostatic assays and 14% both. In those patients receiving more than 4 units of RBC, suggesting ongoing bleeding, haemostatic tests were sent in 79%. BSH guidelines recommend performing coagulation tests every 30–60 minutes, depending on the severity of blood loss, until bleeding ceases. The choice of test depends on local availability and protocols. Where VHAs are in use, locally approved algorithms to guide management based on their results should be readily available.
58% of sites use VHA point of care testing to guide transfusion therapy, with devices most often located in theatres and maternity. Not all sites (78%) have a policy in place for their use and maintenance. In most cases (76%) these operate in isolation, with no interface with other patient record systems. Only 11% are connected with the Electronic Patient Record (EPR) and just 4% with the Laboratory Information Management System (LIMS). This has implications for accurate record keeping and governance, creates risk of error if there is manual transcription, and makes audit of individual case management and review of decision-making very challenging. Sites should work towards systems integration of these devices and consider including the issue on the clinical risk register where they are stand-alone.

Conclusion

This audit provides a comprehensive and reassuring overview of current major haemorrhage practice across a wide range of clinical settings. Overall, the findings demonstrate that major haemorrhage protocols are widely embedded, frequently activated appropriately, and generally effective in ensuring timely access to life-saving blood components. The rapid availability of red cells, with a median time of 18 minutes from MHP activation to transfusion, offers strong assurance that systems are functioning well to support patients with life-threatening bleeding.

Importantly, the audit highlights evolving and increasingly proactive approaches to haemorrhage management. The proportion of patients receiving no red cell transfusion, particularly in obstetrics, reflects pre-emptive activation of MHPs and early control of bleeding. While this has at times created uncertainty for laboratory teams, it underpins the value of early escalation and reinforces the importance of shared understanding between clinical and laboratory services in protocol design and implementation.

Encouraging progress is also evident in several key areas since the previous 2018 audit. There have been improvements in the appropriate use of group O positive red cells, supporting more sustainable management of O negative blood stocks, and greater inclusion of anticoagulation reversal guidance within MHPs. Rates of tranexamic acid use in obstetric and surgical haemorrhage have risen.

At the same time, the audit identifies clear opportunities to strengthen consistency and reliability. Variation in MHP activation methods, incomplete specialty-specific protocols, gaps in training frequency, and challenges with communication, documentation, and IT integration all represent areas where focused local action could deliver significant gains. The findings emphasise the value of regular, multidisciplinary simulation training that includes clinical, laboratory, and support staff, and of

simplifying and harmonising processes to reflect the realities of rotating workforces and infrequent exposure to major haemorrhage events.

To support MHP training, SHOT have released a major haemorrhage simulation toolkit which is freely accessible (see resources below). Transfusion teams, clinical teams and hospital simulation teams are all encouraged to explore the resources within this to help run their own local simulation sessions.

The audit included 91 MHP activations for children under the age of 16 years. As major bleeding in this patient group is uncommon, this is a valuable dataset and a separate analysis will be performed to explore any additional learning points compared to adult practice.

This audit did not seek to assess the clinical management of individual cases, as its focus was compliance with overall application of the MHP. Sites are encouraged to review cases in detail, to include metrics such as time from onset of bleeding to MHP activation, timing of component administration as well as issue, and wastage data.

In summary, this audit suggests good levels of compliance with the operation of major haemorrhage protocols in practice, while identifying some areas for further improvement. By addressing the practical challenges highlighted, sharing learning locally and nationally, and continuing to foster collaboration across teams, services can further enhance the safety, efficiency, and effectiveness of major haemorrhage management. The progress demonstrated since the last audit is encouraging and reflects a system that is responsive, learning, and well placed to continue improving outcomes for patients experiencing major bleeding.

References

1 - Narayan, S. et al., 2025. The 2024 Annual SHOT Report, Manchester: Serious Hazards of Transfusion (SHOT) Steering Group.

2 - CAS Alert – Preventing transfusion delays in bleeding and critically anaemic patients – 17 Jan 2022 Available at: https://www.shotuk.org/resources/safety-alerts-and-safety-notices/safety-alerts/

3 - Green and others on behalf of the National Comparative Audit of Blood Transfusion. '2018 Audit of the Management of Major Haemorrhage' (2019). https://doi.org/10.71745/rgsg-p674

4 - Stanworth SJ, Dowling K, Curry N, Doughty H, Hunt BJ, Fraser L, et al., on behalf of The Transfusion Task Force of the British Society for Haematology. A guideline for the haematological management of major haemorrhage: A British Society for Haematology Guideline. Br J Haematol. 2022; 198: 654–667. https://doi.org/10.1111/bjh.18275

5 - All Wales Guideline: Prevention and Management of Postpartum Haemorrhage 2017. OBS Cymru Quality and Safety Sub Group of Maternity Network Wales.
Available at Obstetric Bleeding Strategy Cymru - Public Health Wales

Resources

SHOT Major Haemorrhage Simulation Toolkit

https://www.shotuk.org/resources/major-haemorrhage-simulation-toolkit/

NHSBT Patient Blood Management O negative Toolkit

https://hospital.blood.co.uk/patient-services/patient-blood-management/appropriate-use-of-blood-components/group-o-red-cells/

E-learning for health Blood component use in major haemorrhage

https://www.e-lfh.org.uk/programmes/blood-component-use-in-major-haemorrhage/

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PATIENT AUDIT BOOKLET

Site number

Audited patient number

About this patient

1. How old was the patient?

☐ Child (<16)
☐ Adult under 50
☐ Adult 50 or over

2. What was the patient's sex at birth? ☐ Female ☐ Male

3. Where was the patient at the time of the major haemorrhage?

☐ Pre-hospital
☐ A & E
☐ Acute medical admissions unit
☐ Medical ward
☐ Surgical ward
☐ Obstetric or Gynae ward
☐ Haematology/Oncology/Bone Marrow Transplant ward or day ward
☐ High Dependency Unit
☐ Intensive Care Unit
☐ Operating Theatre
☐ Recovery
☐ Other, please state:

4. What was the nature of the major haemorrhage?

☐ Trauma
☐ Cardiac surgery
☐ Gastrointestinal surgery
☐ Vascular surgery
☐ Other surgery
☐ GI bleeding that does not require surgical intervention
☐ Medical (non-surgical bleeding)
☐ Gynaecology
☐ Obstetric (including ante-natal and post-partum haemorrhage)
☐ Unable to find information in the patient's records
☐ Other, please state:

5. Was the patient on oral or parenteral anticoagulants at the time of the major haemorrhage?

☐ Yes ☐ No ☐ Don't know

5a. If yes, what was the name of the anticoagulant(s)?

Major Haemorrhage Protocol (MHP) activation

6. Was the MHP activated?

☐ Yes *Now complete questions 6a & b* ☐ No *Now go to question 6c*

6a. Please state the date and time the laboratory was informed of the MHP activation.

D D M M

h h : m m

☐ Date &/or time unknown

Please use 24 hour clock - (e.g.20:15)

6b. Was the process of activation in line with your organisation's MHP?

☐ Yes ☐ No ☐ Unknown

6c. If the MHP was not activated or unknown, please state why:

Thinking about the first unit of red blood cells (RBCs) that was transfused. . .

7. Where was the first unit of RBCs collected from?

☐ The laboratory *Now complete questions 7a, b & c*
☐ Taken from a satellite fridge near to the clinical area *Now complete questions 7b & c*
☐ Other, please state: *Now complete question 7c*

7a. Please give the date and time when the first RBC unit was available for use

D D M M | h h : m m

Please use 24 hour clock - (e.g.20:15)

7b. Please give the date and time when the first RBC unit was collected.

D D M M | h h : m m

Please use 24 hour clock - (e.g.20:15)

7c. Please give the date and start time when this RBC unit was transfused.

D D M M | h h : m m

☐ RBC collected but not used

Please use 24 hour clock - (e.g.20:15)

8. What was the blood group of the first unit of RBCs given?

☐ Emergency O negative *Now go to question 9*
☐ Emergency O positive *Now go to question 9*
☐ The patient's own blood group *Now go to question 10*

9. Please give the date and time when the first unit of the patient's own blood group was issued.

D D M M | H H : m m

Please use 24 hour clock - (e.g.20:15)

☐ No RBC units of patient's own blood group were issued

If no RBC units of patient's own blood group were issued, please indicate why:

- ☐ No sample allowing blood to be issued was sent
- ☐ The sample sent was insufficient
- ☐ The sample sent was rejected for another reason
- ☐ Patient's own group RBCs were not needed (please state why)

Thinking about the first unit of FFP that was transfused . . .

10. Did the patient receive any FFP for this major haemorrhage?

☐ Yes ☐ No *Now go to question 13*

11. Where was the first unit of FFP collected from?

☐ The laboratory *Now complete questions 11a, b & c*
☐ Taken from a satellite fridge near to the clinical area *Now complete questions 11b & c*
☐ Other, please state *Now complete question 11c*

11a. If collected from the laboratory, please give the date and time when the first FFP unit was available for use.

D D M M ☐☐☐☐ h h : m m ☐☐☐☐

Please use 24 hour clock - (e.g.20:15)

11b. Please give the date and time when the first FFP unit was collected.

D D M M ☐☐☐☐ h h : m m ☐☐☐☐

Please use 24 hour clock - (e.g.20:15)

11c. Please give the date and start time when this FFP unit was transfused.

D D M M ☐☐☐☐ h h : m m ☐☐☐☐ ☐ FFP collected but not used

Please use 24 hour clock - (e.g.20:15)

12. Were clotting tests taken to determine the requirement for FFP and Cryoprecipitate?

☐ Yes *Now go to question 13a* ☐ No *Now go to question 14*

12a. If yes, how were they performed?

☐ Point of Care Tests
☐ Laboratory tests

13. What is the total number of units of each component transfused for this major haemorrhage episode up until 24 hours after MHP activation (or 24 hours after start of bleeding if MHP was not activated)?

RBC	
Fresh Frozen Plasma (FFP)	
Platelets	
Cryoprecipitate	

14. Is there documented evidence that the haemostatic agents shown below were used in this major haemorrhage episode up until 24 hours after MHP activation (or 24 hours after start of bleeding if MHP was not activated)?

	Yes	No	Date administered D D M M	Time administered h h : m m
14a: rFVIIa	☐	☐	☐☐☐☐	☐☐☐☐
14b: PCC	☐	☐	☐☐☐☐	☐☐☐☐
14c: Fibrinogen concentrate	☐	☐	☐☐☐☐	☐☐☐☐
14d: Vitamin K Phytonadione, Mephyton	☐	☐	☐☐☐☐	☐☐☐☐
14e: Aprotonin	☐	☐	☐☐☐☐	☐☐☐☐

Please use 24 hour clock - (e.g.20:15)

15. Is there documented evidence that Tranexamic acid was used in this major haemorrhage episode up until 24 hours after MHP activation (or 24 hours after start of bleeding if MHP was not activated)?

☐ Yes *Now go to question 15a* ☐ No *Now go to question 15b*

15a. please give details of doses of Tranexamic acid given:

	Date administered D D M M	Time administered h h : m m	**Dose (g)**
1st dose	☐☐☐☐	☐☐☐☐	
2nd dose	☐☐☐☐	☐☐☐☐	
3rd dose	☐☐☐☐	☐☐☐☐	
4th dose	☐☐☐☐	☐☐☐☐	

Please use 24 hour clock - (e.g.20:15)

15b. If Tranexamic acid was not given, why not?

16. Is the use of haemostatic agents (as documented in questions 14 and 15) within your local guideline recommendations?

☐ Yes ☐ No

17. Was the MHP stood down?

☐ Yes ☐ No

17a. If yes, please give the date and time when the MHP was stood down.

D D M M

☐☐☐☐

h h : m m

☐☐☐☐

☐ Not recorded

Please use 24 hour clock - (e.g.20:15)

18. Were there any delays or problems reported by the clinical area or laboratory in relation to this major haemorrhage?

☐ Yes ☐ No

18a. If yes, please give details:

End of questionnaire

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ORGANISATIONAL SURVEY

1. Does your organisation have a major haemorrhage protocol (MHP)?

Yes ☐ No ☐

If yes, go to Q2. If no, go to Q11

2. Does your hospital have a separate MHP for:

Paediatrics	Yes ☐	No ☐
Obstetrics	Yes ☐	No ☐
Cardiac	Yes ☐	No ☐
Trauma	Yes ☐	No ☐

3. How is the MHP activated in your hospital? *(e.g. 2222 or another emergency number)*

4. Is the activation of the MHP the same process used across all sites in your Trust?

Yes ☐ No ☐ We only have 1 site ☐

5. Does the MHP require a separate phone call to the laboratory?

Yes ☐ No ☐

6. Does the MHP detail the concessionary, rapid release of the best matched red blood cells for patients with red cell antibodies?

Yes ☐ No ☐

7. Does the MHP include the rapid reversal of anticoagulants?

Yes ☐ No ☐

8. Does the MHP include the use of PCC (excluding anticoagulation)?

Yes ☐ No ☐

If yes, which type of MHP does it cover: (*Tick as many as apply)*

General (Medical/Surgical) ☐

Paediatrics ☐

Obstetrics ☐

Cardiac ☐

Trauma ☐

9. Does the MHP include the use of Fibrinogen Concentrate?

Yes ☐ No ☐

If yes, which type of MHP does it cover: (*Tick as many as apply)*

General (Medical/Surgical) ☐

Paediatrics ☐

Obstetrics ☐

Cardiac ☐

Trauma ☐

10. Does the MHP specify the need to send a G&S sample to the lab?

Yes ☐ No ☐

11. Does your hospital have a policy for issuing group O positive units to males and to females who are over 50 years old?

Yes ☐ No ☐

12. Do you have remote blood fridges at your hospital?

Yes ☐ No ☐

If yes, go to Q13. If no, go to Q15

13. Are these fridges operated:

☐ Electronically (kiosk)

☐ Manually (paper based)

14. Do you stock both O negative and O positive for units for emergency use in remote blood fridges?

Yes ☐ No ☐

15. Is your hospital a major trauma centre?

Yes ☐ No ☐

16. Do you keep pre-thawed FFP for use in MH?

Yes ☐ No ☐

If yes, go to Q17. If no, go to Q18

17. Where is this located:

☐ Laboratory

☐ Remote fridges

18. Does your hospital use point of care testing (i.e. TEG/ROTEM) to guide transfusion therapy?

Yes ☐ No ☐

If yes, go to Q19. If no, go to Q22

19. Do you have a policy in place for its use and maintenance?

Yes ☐ No ☐

20. Where Is the point of care device located?

☐ Laboratory

☐ Theatres

☐ Maternity

☐ Emergency Department

☐ Other, please specify in the space below:

21. Are they interfaced to:

☐ EPR

☐ LIMS

☐ Both

☐ Neither

22. Does your hospital have cell salvage?

Yes ☐ No ☐

If yes, go to Q23. If no, go to Q25

23. Is cell salvage available 24 hours a day/7 days a week?

Yes ☐ No ☐

24. Cell salvage is available and used in:

☐ Obstetrics

☐ Orthopaedic surgery

☐ General surgery

☐ Other, please specify in the space below:

25. Does your hospital conduct MH simulation/drills?

Yes ☐ No ☐

If yes, go to Q26. If no, go to Q30

26. How often does this training occur?

☐ Once a year

☐ Less than once a year

☐ Twice a year

☐ More than twice a year

27. The training involves (select all options):

☐ Recognition of bleeding

☐ Importance of communication

☐ Processes for activation of major haemorrhage protocols

☐ Rapid access to blood components and products

☐ Appropriate use of group O / switch to group specific

28. Does the training involve both laboratory and clinical staff?

Yes ☐ No ☐

29. Which clinical areas are covered?

☐ A&E / ED

☐ Maternity

☐ Paediatrics

☐ Wards

☐ Other, please specify in the space below:

30. Does your hospital perform audits of the MH protocol?

Yes ☐ No ☐

If yes, go to Q31. If no, you have completed this survey

31. How often do these audits occur?

- ☐ Once a year
- ☐ Less once a year
- ☐ Twice a year
- ☐ More than twice a year

END

Appendix C – List of participating sites

Addenbrooke's Hospital
Aintree University Hospital
Airedale NHS Foundation Trust
Antrim Area Hospital
Ashford and St. Peter's Hospitals NHS Foundation Trust
Barnet Hospital
Barnsley Hospital NHS Foundation Trust
Basildon University Hospital
Basingstoke and North Hampshire Hospital
Bassetlaw Hospital
Bedford Hospital
Birmingham Children's Hospital
Birmingham Women's Hospital
Blackpool Teaching Hospitals NHS Foundation Trust
Bolton NHS Foundation Trust
Borders General Hospital
Bradford Teaching Hospitals NHS Foundation Trust
Bristol Royal Infirmary
Broomfield Hospital
Burnley General Teaching Hospital
Calderdale Royal Hospital
Castle Hill Hospital
Causeway Hospital
Central Middlesex Hospital
Charing Cross Hospital
Chelsea and Westminster Hospital
Chesterfield Royal Hospital NHS Foundation Trust
City Hospital Campus
Cleveland Clinic London
Colchester Hospital
Conquest Hospital
Countess of Chester Hospital NHS Foundation Trust
Croydon Health Services NHS Trust
Cumberland Infirmary
Darlington Memorial Hospital
Dartford and Gravesham NHS Trust
Diana, Princess of Wales Hospital
Doncaster Royal Infirmary
Ealing Hospital
East Cheshire NHS Trust
Eastbourne District General Hospital
Fairfield General Hospital
Frimley Park Hospital
Furness General Hospital
Gateshead Health NHS Foundation Trust
George Eliot Hospital NHS Trust
Glan Clwyd Hospital
Gloucestershire Hospitals NHS Foundation Trust
Great Ormond Street Hospital For Children NHS Foundation Trust
Great Western Hospitals NHS Foundation Trust
Guy's & St Thomas' NHS Foundation Trust
Hammersmith Hospital
Harefield Hospital
Harrogate and District NHS Foundation Trust
Hinchingbrooke Hospital
Homerton Healthcare NHS Foundation Trust
Huddersfield Royal Infirmary
Hull Royal Infirmary
Ipswich Hospital
Isle of Wight Healthcare NHS Trust

James Paget University Hospitals NHS Foundation Trust

Kent and Canterbury Hospital

Kettering General Hospital NHS Foundation Trust

King's College Hospital

Kingston and Richmond NHS Foundation Trust

Lincoln County Hospital

Lister Hospital

Liverpool Women’s NHS Foundation Trust

Luton and Dunstable University Hospital

Maidstone and Tunbridge Wells NHS Trust

Manchester University NHS Foundation Trust

Medway NHS Foundation Trust

Mid Cheshire Hospitals NHS Foundation Trust

Mid Yorkshire Teaching NHS Trust

Midland Metropolitan University Hospital

Milton Keynes University Hospital NHS Foundation Trust

Musgrove Park Hospital

National Maternity Hospital Dublin

Nevill Hall Hospital

Newham University Hospital

NHS Forth Valley

NHS Lothian

Noble's Hospital Isle of Man

Norfolk and Norwich University Hospitals NHS Foundation Trust

North Bristol NHS Trust

North Tees and Hartlepool NHS Foundation Trust

Northampton General Hospital NHS Trust

Northern General Hospital

Northumbria Specialist Emergency Care Hospital

Northwick Park Hospital

Oxford University Hospitals NHS Foundation Trust

Peterborough City Hospital

Pilgrim Hospital

Poole Hospital

Prince Charles Hospital

Princess Royal University Hospital Farnborough

Queen Elizabeth Hospital Greenwich

Queen Elizabeth The Queen Mother Hospital

Queen's Hospital Romford

Queen's Medical Centre

Raigmore Hospital

Royal Berkshire NHS Foundation Trust

Royal Blackburn Teaching Hospital

Royal Bournemouth Hospital

Royal Brompton Hospital

Royal Cornwall Hospitals NHS Trust

Royal Derby Hospital

Royal Devon University Healthcare NHS Foundation Trust

Royal Free Hospital

Royal Glamorgan Hospital

Royal Gwent Hospital

Royal Hallamshire Hospital

Royal Hampshire County Hospital

Royal Lancaster Infirmary

Royal Liverpool University Hospital

Royal Marsden Hospital Sutton

Royal National Orthopaedic Hospital NHS Trust

Royal Oldham Hospital

Royal Papworth Hospital NHS Foundation Trust

Royal Preston Hospital

Royal Stoke University Hospital

Royal Surrey NHS Foundation Trust

Royal Sussex County Hospital

Royal United Hospitals Bath NHS Foundation Trust

Salford Royal Hospital

Salisbury NHS Foundation Trust

Scarborough Hospital

Scunthorpe General Hospital

Sherwood Forest Hospitals NHS Foundation Trust

South Tees Hospitals NHS Foundation Trust

South Tyneside District Hospital

South Warwickshire NHS Foundation Trust

St. George's University Hospitals NHS Foundation Trust

St. Helier Hospital

St. Mary's Hospital Paddington

St. Richard's Hospital

St. Vincent's University Hospital Dublin

Stockport NHS Foundation Trust

Sunderland Royal Hospital

Surrey and Sussex Healthcare NHS Trust

Tameside and Glossop Integrated Care NHS Foundation Trust

The Christie NHS Foundation Trust

The Clatterbridge Cancer Centre NHS Foundation Trust

The Dudley Group of Hospitals NHS Foundation Trust

The Grange University Hospital

The Hillingdon Hospitals NHS Foundation Trust

The Leeds Teaching Hospitals NHS Trust

The Newcastle upon Tyne Hospitals NHS Foundation Trust

The Princess Alexandra Hospital NHS Trust

The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust

The Queen Elizabeth University Hospital

The Rotherham NHS Foundation Trust

The Royal London Hospital

The Royal Wolverhampton NHS Trust

The Shrewsbury and Telford Hospital NHS Trust

Torbay and South Devon NHS Foundation Trust

University College London Hospitals NHS Foundation Trust

University Hospital Lewisham

University Hospital Monklands

University Hospital of North Durham

University Hospital of Wales

University Hospital Southampton NHS Foundation Trust

University Hospitals Birmingham NHS Foundation Trust

University Hospitals Coventry and Warwickshire NHS Trust

University Hospitals of Leicester NHS Trust

University Hospitals Plymouth NHS Trust

Warrington & Halton Hospitals NHS Foundation Trust

West Hertfordshire Teaching Hospitals NHS Trust

West Middlesex University Hospital

West Suffolk NHS Foundation Trust

Weston General Hospital

Wexham Park Hospital

Whipps Cross Hospital

Whiston Hospital

Whittington Health NHS Trust

William Harvey Hospital

Wirral University Teaching Hospital NHS Foundation Trust

Worthing Hospital

Wrexham Maelor Hospital

Wrightington, Wigan and Leigh NHS Foundation Trust

Wye Valley NHS Trust

Yeovil Hospital

York Hospital

Ysbyty Gwynedd

Ysbyty Ystrad Fawr

Appendix D – Full recommendations

Full recommendations for the audit and the organisational survey:

1. Governance and Protocol Design

- Standardise MHP activation pathways within Trusts/Health Boards, ideally to a single, simple method (e.g. 2222 without additional steps)
- Ensure specialty-specific MHPs (particularly paediatrics and obstetrics) are available, accessible, and aligned with national guidance
- Ensure advice on reversal of anticoagulation is included within the MHP or linked protocols which are also readily accessible
- Review organisation-wide communication strategies to ensure all clinical and laboratory staff understand activation and stand-down processes
- Engage laboratory, clinical, switchboard and portering teams jointly when designing or revising MHPs

2. Training and Simulation

- Implement mandatory annual major haemorrhage simulations involving:
  - Clinical teams across high risk areas-risk areas
  - Transfusion laboratory staff
  - Switchboard and portering services
- Ensure training explicitly covers:
  - Correct activation and stand-down procedures-down procedures
  - Appropriate use of group O RBCs
  - Importance of prompt G&S sampling
  - Use and limitations of TxA
  - Communication expectations between clinical and lab teams
- Disseminate learning from each simulation organisation-wide

3. Emergency Red Cell Provision

- Review remote blood fridge stocking to ensure, where policy permits, availability of both O positive and O negative units
- Reinforce guidance on prioritising O positive for males and females over 50 years to reduce demand on O negative stock
- Include G&S sampling and emergency group O usage scenarios in drills to reduce cases where sampling issues prevent switch to group specific blood

4. Coagulation and Haemostatic Testing

- Increase adherence to national guidance recommending regular coagulation monitoring (laboratory or VHAs) during active haemorrhage
- Ensure VHA devices have local algorithms and governance structures to support consistent use
- Work towards IT integration of VHAs with EPR/LIMS to minimise transcription risk and improve audit quality

5. Plasma and Component Therapy

- Audit individual MHP activations, to include the type, volume and timing of components transfused
- Improve compliance with recommended FFP:RBC ratios, especially in:
    - trauma (target 1:1)
    - cases with ongoing bleeding where testing is unavailable
- Review operational factors contributing to the time to first FFP release and consider:
    - local thawing capacity
    - pre-thawed FFP availability
    - workflow optimisation

6. Tranexamic Acid Use

- Reinforce within MHPs that:
    - TxA should be given ideally within 10 minutes, and no later than 3 hours from bleeding onset
    - TxA is not routinely recommended in gastrointestinal bleeding
- Improve documentation of TxA timing and dose

We invite you to use this action plan framework on the next page to address any issues that arose from your individual site report.

Appendix E – Action template

Action	Team	Lead	Suggested timescale
Governance and Protocol Design Review organisation-wide communication strategies to ensure all clinical and laboratory staff understand activation and stand-down processes	Transfusion team in collaboration with: Clinical directorates Laboratory Manager		
Training and Simulation Implement mandatory annual major haemorrhage simulations	Transfusion teams in collaboration with: Clinical directorates Laboratory Manager Switchboard and Portering		

Action	Team	Lead	Suggested timescale
Emergency Red Cell Provision Review remote blood fridge stocking to ensure, where policy permits, availability of both O positive and O negative units Reinforce guidance on prioritising O positive for males and females over 50 years to reduce demand on O negative stock Include G&S sampling and emergency group O usage scenarios in drills to reduce cases where sampling issues prevent switch to group specific blood	Transfusion teams in collaboration with: Laboratory managers Pathology managers All those ordering blood Those delivering training in the management of major haemorrhage		

Action	Team	Lead	Suggested timescale
Plasma and Component Therapy Audit individual MHP activations, to include the type, volume and timing of components transfused	Transfusion teams in collaboration with: Clinical Audit Department		
Tranexamic Acid Use Reinforce within MHPs that: TxA should be given ideally within 10 minutes, and no later than 3 hours from bleeding onset TxA is not routinely recommended in gastrointestinal bleeding Improve documentation of TxA timing and dose	Transfusion teams		