



# NHS Wales Red Cell Shortage Plan

*The following plan has been written by Welsh Blood Service (WBS) in collaboration with NHS Wales Hospital Transfusion Teams and the Blood Health National Oversight Group (BHNOG)*

# Executive Summary

- 1.1 This document sets out the plan in the event of a shortage of allogeneic (i.e. donor) red blood cells. It has been produced by the WBS, in collaboration with Hospital Transfusion Committees/Teams (HTC/HTT) across Wales, Emergency Planning Advisory Group Leads (EPAG), Medical Directors and the Blood Health National Oversight Group (BHNOG).
- 1.2 Hospitals and the WBS will work together to reduce the risk of red cell shortages through the effective management of both the supply and demand for blood. This includes use of Patient Blood Management (PBM) principles /appropriate conservation strategies<sup>1</sup> and relevant internal WBS supply initiatives.
- 1.3 This document updates the integrated plan for blood shortages originally published by Welsh Government (WG) in the 2009 document '*CONTINGENCY PLANNING - AN INTEGRATED PLAN FOR THE MANAGEMENT OF BLOOD SHORTAGES*<sup>2</sup>' and builds on the principles of the original and subsequent plans.
- 1.4 It identifies actions to be taken by both the WBS and hospitals/Health Boards (HBs) in the event of a potential or actual red cell shortage. The latest version incorporates feedback received as a result of the blood shortage tabletop exercise run in October 2022.
- 1.5 The plan advocates that patients who need blood receive a transfusion regardless of their geographical location. The arrangements are designed to assure that:
  - Access to red cells is equitably available for all essential patient transfusions
  - Overall red cell usage is managed so that the most urgent cases receive sufficient red cells for their needs.
  - Health Boards (HBs) are requested to consider stock sharing both within and across Wales to support effective use of blood
- 1.6 A shortage of red cells may be associated with a platelet shortage. Please refer to the WBS Platelet Shortage Plan<sup>3</sup> for further information.
- 1.7 The NHS Wales Red Cell Shortage Plan describes four phases dependent on WBS red cell stock levels - Green, Pre-Amber, Amber and Red. The green phase is focused on the implementation of Patient Blood Management (PBM) principles to ensure blood is used appropriately and prudently.
- 1.8 In each HB/hospital there are established business continuity planning arrangements, which would be activated to manage red cell shortages in the Amber and Red phases. Should the situation deteriorate to such an extent, command & control measures should be activated as detailed in Major Incident Plans/Business Continuity and other Emergency Response Plans
- 1.9 The Pre-Amber alert is used specifically by the WBS to prevent stocks moving to Amber phase. Hospital staff will receive a Pre-amber notification of a potential shortage, which has not yet breached the Amber threshold. This phase has been introduced to encourage greater collaborative working between hospitals and the WBS e.g. agreed reduction in stock levels, negotiation of orders etc. to actively manage the national supply chain and alleviate the necessity to progress to a more formal alert level thereby averting more severe shortages. This is business continuity management and will be managed via the respective Pathology Business Continuity process.

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## 2.0 Background

- 2.1. The Civil Contingencies Act<sup>4</sup> (2004) requires NHS organisations to demonstrate that they can deal with disruptive incidents while maintaining services. As part of Emergency Preparedness, Resilience and Response (EPRR), there is a requirement for services to develop business continuity plans (BCPs) to respond to supply issues such as a shortage within the blood supply chain, and to ensure the effective use of available blood components when blood stocks fall below pre-determined levels. It is recognised that clinical judgement is an essential part of decision making for individual patients. Clinical responsibility regarding this area should be expanded in HB's BCP and EPRR policies. These plans will be critical to ensuring transfusion support remains available for the patients who need it most.
- 2.2 Although severe red cell shortages are rare in Wales and the UK generally recent experiences such as the COVID 19 pandemic and industrial action have exposed the fragility of the blood supply chain. This has sometimes resulted in prolonged periods of shortage as several multi factorial issues are managed.
- 2.3 The original integrated plan for the management of red cell shortages incorporated a framework to manage shortages in a variety of situations, including but not exclusive to:
  - Short-term shortages, caused by, for example, adverse weather.
  - Very acute shortages caused by, for example, security issues, which stop donors donating.
  - Prolonged blood shortages, which could result from a number of circumstances e.g. the introduction of further measures to reduce the risk of disease transmission by transfusion or a pandemic.
  - Unexpected increases in demand e.g. mass casualty incidents

## 3.0 Planning Principles

- 3.1 The NHS Wales red Cell Shortage plan is designed to ensure that the WBS, together with Transfusion Services and the wider hospitals/HBs in Wales work in a collaborative process, to provide an integrated approach to manage red cell supply, avoid shortages and minimise any impact on patients as far as possible.
- 3.2 The plan is designed to operate routinely even when there is no shortage. Where there are modest reductions in the blood supply, for example <10% reduction, appropriate use of blood conservation strategies (PBM) together with the active management of the blood supply chain should avoid the activation of formal blood shortage arrangements.
- 3.3 The appropriate use of donor blood and the use of effective alternatives to blood are important public health and clinical governance issues. This plan is designed to build on actions taken by hospitals/health boards to improve transfusion safety and effectiveness in accordance with the Blood Health Plan<sup>5</sup>.

## 4.0 Plan Structure

- 4.1 The plan is structured to provide a framework of actions for WBS and hospitals/HBs at four phases (refer Fig. 1 below). A summary table of the Blood Shortage categories & actions is shown in Appendix 1.

<b>Green Alert</b> Target blood stocks maintained; supply aligned to demand
<b>Pre - Amber Alert</b> Forecasts indicate that stock(s) are under pressure, requests for stock reductions and negotiations for stock management are likely to occur
<b>Amber Alert</b> Reduced availability of blood for a prolonged period with limited ability to recover stocks
<b>Red Alert</b> Severe and/or prolonged shortages or imminent threat to the blood supply

Fig. 1

- 4.2 During the **Green** phase, the WBS will maintain normal operations, target blood stocks are maintained, and supply is aligned to demand. Hospital/HBs will be encouraged to advocate PBM principles for prudent and appropriate use.
- 4.3 In the **Pre-Amber** phase, the WBS will issue a Pre-Amber alert notification to hospitals informing them of potential pressures on the supply chain and in collaboration with hospital colleagues implement the actions required to protect supply. Hospitals will be requested to distribute this alert notification to relevant clinical and management teams across their health board this will include escalation through Pathology business continuity response routes to familiarise themselves with actions in **Amber** should this be necessary. This action is intended to prevent the requirement to move to the **Amber** phase. This alert may apply to either a single blood group or a number or all of the blood groups.
- 4.4 The WBS will actively manage their stock to minimise the risk of blood shortages, implementing specified internal actions to support collections and stock management. However, if red cell stocks fall lower than the pre-determined level then shortage plans may be activated and communications to move to an **Amber** phase will be issued. These will follow guidance as for **Pre-Amber** alert but will also be escalated to the Welsh Government (WG). This may apply to either a single blood group or to a number or all of the blood groups.
- 4.5 Should the WBS identify a severe, imminent threat to the blood supply then, they will communicate a move directly to the **Red** phase. This will follow guidance as for **Pre-Amber** and **Amber** alerts in addition to the guidance for Red.

- 4.6 Each hospital/HB are required to have, as part of their overall emergency planning, an escalation process through their established governance structures to respond to alerts from the WBS. This will be via the respective service Business Continuity Management process, where there are escalation processes articulated. The response may require a reduction in both blood stocks and red cell use. It is recommended that use of red cells should be prioritised according to the guidance in Appendix 2.

## 5.0 WBS Actions

- 5.1 Stock levels are reviewed daily through WBS Resilience meetings and collection/manufacturing activities are monitored to ensure stock levels are kept at the pre-determined target levels. Monthly Capacity/Demand Planning meetings are used to set strategic direction. However, if these measures are unable to support the stock position, then either a divisional Emergency Planning meeting or a Trust meeting using the bronze/silver/gold command structure will be established and several additional actions may be taken.

These actions include but are not limited to:

- Calling more donors or targeting donors of a specific blood type. This might also mean deferring donors of blood groups that are plentiful and replacing with those of the group under pressure. This will be at the discretion of the Collections Manager/Donor Engagement Manager
- Extending shifts in the manufacturing/testing departments to increase manufacturing.
- Extending the opening times of current scheduled donor sessions/establish new donor sessions.
- Increased monitoring of stock ensuring it is distributed according to age and group mix, to keep wastage to a minimum.
- Utilising our mutual aid arrangements with other UK blood services.
- Activation of the BHNOG Blood Shortage Group (BSG) (Refer to Appendix 5 for Terms of Reference)

If these actions prove to be unsuccessful, WBS will declare a red cell shortage. This will be communicated via the Shortage Alert process and escalated to the appropriate phase.

## 6.0 Hospital Business Continuity Response

- 6.1 Each hospital/HB should have the ability to set up appropriate operational, tactical and strategic business continuity arrangements to respond to, and deal with blood supply chain issues.
- 6.2 Blood component shortages in the **Amber** and **Red** phases would need to be escalated in the same way as staffing shortages (e.g. strikes) fuel shortages, shortages of oxygen or any other critical service disruption for the care of patients. This is business continuity management. For the purposes of an **Amber** or **Red** blood shortage alert, the appropriate Business Continuity command and control structures will be established

and should include key staff in the organisation including, staff supporting blood transfusion will be subject matter experts to assist in the decision-making process during the shortage.

Business Continuity Response
Essential
Consultant Haematologist responsible for Transfusion
Hospital Transfusion Committee Chair (or equivalent)
Transfusion Laboratory Manager
Transfusion Practitioner
As appropriate stakeholders from:
Clinical Directors of departments which are high blood users, in particular those with urgent/emergency need for blood e.g. critical care, acute medicine, accident and emergency, anaesthesia, surgery, obstetrics & paediatrics,

- 6.3 The responsibility of the hospital business continuity management process and associated command and control structures, if an escalated state, is to provide strategic guidance and formulate arrangements to manage the appropriate use of red cells in both the **Amber** and **Red** operational phase. This is as part of their existing business continuity and emergency response arrangements.
- 6.4 Proposed generic actions for hospitals at **Green**, **Pre-Amber**, **Amber** and **Red** are defined in Appendix 3. The actions are dependent on the local case mix and configuration of services within each HB. These should be included within Pathology Service business continuity plans.
- 6.5 Routinely, Business Continuity Plans should clarify the roles and responsibilities of staff and give clear guidance for internal communication. Consideration should be given to centralising hospital/HB stock and modification of surgical lists.
- 6.6 Once the arrangements have been agreed the documentation should be managed by the Hospital Transfusion Team (HTT) and senior clinical staff representing the main users of blood.
- 6.7 Should the alert move from **Pre-Amber** to **Amber** and a red cell shortage occur, WBS will activate their emergency plan and notify HTTs to implement their business continuity incident response arrangements. In an **Amber** or **Red** shortage, actions within hospitals may need to be reviewed daily by relevant clinical service leads and the Chair of the tactical group as appropriate.
- 6.8 It is recommended that each HB response should have senior hospital management support i.e. from the Chief Executive and/or Medical Director's teams to ensure their effectiveness. If in **Red** alert, there will be a strategic and tactical command and control arrangements and Clinical staff should be aware of their responsibilities as appropriate and understand that a decision-making process, is necessary when the supply of red cells is limited.

- 6.9 If an Amber alert is declared all requests to the transfusion laboratory should be reviewed by senior laboratory staff and referred to the hospital Haematology Specialist Registrar or Consultant if request does not comply with current British Society Haematology (BSH) guidance.
- 6.10 If a Red alert is activated all requests to the transfusion laboratory should be reviewed by hospital Haematologists (registrar or Consultant) for appropriateness before the order is placed with WBS.
- 6.11 If the WBS are unable to meet a request (except in an emergency) and no suitable alternative is available then the request will be referred to a WBS Consultant for advice and further consultation with hospital colleagues.
- 6.12 It is recommended that hospitals/HBs refer to the NHS Wales Red Cell Shortage Plan for practical use during a red cell shortage.

## 7.0 Indications for Transfusion

- 7.1 The indications for transfusion are taken from UK national guidelines for the use of blood components and are provided in the '*Indication Codes for Transfusion: an Audit Tool*<sup>6</sup>'. Whilst it is acknowledged that clinical judgement plays an essential part in the decision to transfuse or not, the purpose of drawing available transfusion guidelines together into a single resource is to help clinicians prioritise the use of blood transfusion. It is recommended that the national indication codes for blood transfusion are used to document the indication for transfusion. These are available on the transfusion request form, as a QR code on the All-Wales Transfusion record and as an app for use on IOS & Android phones<sup>6</sup>.
- 7.2 It is recognised practice that patients undergoing elective surgical operations should not routinely require transfusion support if their Haemoglobin (Hb) concentration is pre-optimised before surgery. Assuming normovolaemia has been maintained, the Hb can be used in conjunction with clinical assessment to guide the appropriate use of red cell transfusion.
- 7.3 Patient Blood Management (PBM) measures to avoid the use of blood transfusion include pre-operative iron replacement for iron deficiency anaemia, and the use of tranexamic acid for surgical patients likely to have at least moderate blood loss (>500ml) or >10% blood volume loss in children and patients weighing less than 50kg.
- 7.4 Overreliance on group O D negative red cells may have a negative impact on the management of this scarce resource. Blood services worldwide encounter recurrent shortfalls of O D negative red cells. It is important that patients are prioritised with respect to their transfusion needs to identify those where the use of O D negative cells is essential. Group O D positive red cells may be used for adults of non-childbearing potential where no anti-D is detectable. Hospitals are directed to the Management and Use of O D Neg Red Cells guidance<sup>7</sup>.



- 7.5 The provision of O D negative red cells for use in the pre-hospital setting should also be retained for individuals of child-bearing potential. The emergency service currently advocates the use of O D Positive for adults of non-childbearing potential but the service provision to supply may need to be reviewed to determine its suspension or reduction in units provided. This will need to be a multidisciplinary decision.
- 7.6 Ensure that unused blood is returned to stock in a timely manner to avoid time expiry/out of temperature wastage.

## 8.0 Operation of the Plan

### 8.1 Green

- 8.1.1 All routine operations should be undertaken. Collections and manufacturing activities will be performed in accordance with anticipated demand.
- 8.1.2 Hospitals are requested to send daily stock levels to WBS and to review optimum stock levels on a 6 monthly basis in collaboration with WBS.
- 8.1.3 WBS manage red cell collections to maintain appropriate stock levels across all groups as necessary.
- 8.1.4. Hospitals/HBs will develop their Business Continuity Blood Management Arrangements and integrate into their business continuity response structures.
- 8.1.5 Implementation of PBM principles incorporating the prudent and appropriate use of blood is advocated (ref Appendix 6).

### 8.2 Pre-Amber Alert

#### WBS Actions

- 8.2.1 Hospitals/HBs will be advised via the Pre- Amber alert notification that WBS blood stocks are under pressure with negotiations on orders of component(s) likely to occur.
- 8.2.2 The WBS will maintain clear communications and logistics plans to support hospitals as effectively as possible during shortages. Communications will be sent out on a clear schedule ensuring everyone in the supply chain is informed. This will include invoking the shortage alert protocol.
- 8.2.3 The WBS will review hospital/HB stock levels and compare with total stock. Demand forecasting will be used to inform allocation strategies.

- 8.2.4 The WBS will follow their internal Business Continuity Plan, implementing a number of measures defined but limited to those listed in Section 5.1.

#### Hospital Transfusion Team Actions

- 8.2.5 For the blood groups subject to alert hospital transfusion teams should aim to maintain stocks at their optimum level or 10% below this if possible.
- 8.2.6 Hospitals transfusion teams are requested to send daily stock updates to the WBS by 9.30 a.m. via the BSMS Vanessa platform
- 8.2.7 Conserve O D negative red cells for O D negative patients and individuals of childbearing potential in an emergency.
- 8.2.8 Review stock holding age range and accept shorter dated blood where there is an opportunity to use it. Where possible avoid requesting fresh red cells for stock.
- 8.2.9 Establish communications with key clinical teams in high use areas about a potential move to Amber alert and the implication of this.
- 8.2.10 Ensure clear and effective communication of the pre-Amber alert both within the transfusion team and to key stakeholders.

#### Hospital Clinical Team Actions

- 8.2.11 Use of red cells should be in accordance with appropriate use and prudent Patient Blood Management (PBM) principles (Appendix 6).
- 8.2.12 Review triggers for red cell use by using a restrictive transfusion programme where identified in PBM guidance.
- 8.2.13 Use tools available to support decisions to transfuse including alternatives to transfusion e.g. intraoperative cell salvage, IV iron for anaemia and use of the NBTC Blood Components App<sup>6</sup> to guide decisions.
- 8.2.14 Ensure clear and effective communication of the pre-Amber alert to relevant clinical colleagues.
- 8.2.15. Clinical teams must familiarise themselves with the requirements of an Amber alert and prepare for the establishment of a tactical Business Continuity Response Group as appropriate.

### 8.3 Amber Alert

- 8.3.1 In addition to the measures in the Pre Amber phase, the following measures will be added:

- 8.3.2. If stocks fall to a pre-determined level or an imminent threat to the blood supply is identified, the WBS will communicate a move to the **Amber** phase. This may apply to either a single blood group or to a number of blood groups or to all of the blood groups.
- 8.3.3 Hospitals will be expected to inform and convene their Business Continuity Response tactical Group and if necessary, escalate and integrate this with emergency incident command and control arrangements. The Business Continuity tactical Response Group will define which members of staff will participate in the shortage management and how a reduction in usage will be achieved.
- 8.3.4 Information from the WBS about blood shortages will be communicated to hospitals by sending the relevant Blood Shortage Alert message. The information will include the nature of the shortage and any actions, which need to be taken by hospitals as part of their business continuity response.
- 8.3.5 This information will also be forwarded to Welsh Government.
- 8.3.6 Hospitals may be required to revise their usage and stockholding further. This will be agreed in discussion and consultation with each HB ensuring as far as possible no risk to patient safety because of reductions.
- 8.3.7 Requests for blood may go through a WBS Consultant if considered inappropriate.
- 8.3.8 Transfusion teams will be asked to consider
- Reduction in reservation periods
  - Reduction of stocks in remote fridges or in the case of Remote Issue (RI) disable this function and move to Remote Allocation
  - Reduction of irradiated stock ordering more as and when required.
  - Limiting requests for phenotyped units for stock and ordering on a named patient basis
  - Consider stock sharing across HBs to support use of blood in another HB
- 8.3.9 Initiation of the BHNORG Blood Shortage Group by WBS (ref Terms of Reference Appendix 5).
- 8.3.10 If patient care is adversely affected by the red cell shortage this must be communicated to the patient by the Consultant in charge of their care as defined in Duty of Candour regulations. WBS consultants will provide support and advice as required. Any adverse incident must be reported to the Serious Hazards of Transfusion (SHOT) haemovigilance monitoring scheme.
- 8.3.11 If, stocks continue to fall, the WBS may communicate that a greater reduction in usage is required. This may be within the **Amber** phase or be accompanied by the escalation of a move to the **Red** phase.

## 8.4 Red Alert

- 8.4.1 WBS will declare a **Red** alert if there is a severe shortage of red cells, or if an imminent severe threat to the supply of red cells is identified.
- 8.4.2 WBS will communicate with hospitals as in the **Amber** phase and will include all the actions identified in Amber.
- 8.4.3 In addition to the alert notifications WBS will chair an all-Wales meeting to include representatives from Velindre Exec. Board, HBs, the BHNNOG Blood Shortage Group and Welsh Government.
- 8.4.4 Velindre will be required to provide a 'No Surprises' communication to Welsh Government
- 8.4.5 Actions will include a further reduction in stockholding and a reduction in usage to be agreed with hospital teams.
- 8.4.6 There will be a requirement to consider appropriate transfusions (Appendix 2) and emergency framework for blood rationing<sup>8</sup>.
- 8.4.7 All requests for red cells will need to be agreed in consultation with lead HB consultant haematologist and WBS medical consultants prior to issue.
- 8.4.8 Hospitals/HBs are directed to the National Blood Transfusion Committee (NBTC) guidance and triage tool for the rationing of blood for massively bleeding patients during a severe national blood shortage<sup>8</sup>. This has been adapted from Canadian guidance<sup>9</sup> for UK practice and aligns with guidelines used by other UK Blood Services e.g. NHS Blood & Transplant (NHSBT). Appendix 4a & 4b outlines the algorithm for triaging patients in the context of a severe national shortage.  
This will include a strategic, tactical and operational command and control structure.

## 9.0 Impact and monitoring of shortages

- 9.1 Most declared shortage scenarios will need to be accompanied by a reduction in red cell usage by hospitals/HBs.
- 9.2 Where the required reduction in usage is quite small it is anticipated that hospitals/HBs will be able to achieve this through the implementation of PBM/ conservation/ appropriate use measures. However, hospitals may also have to consider cessation of procedures in Category 3 (Appendix 2) to achieve the required reductions in usage.
- 9.3 In a prolonged shortage this will inevitably have an impact on elective surgery and waiting lists. In a more severe shortage reductions in usage will need to be achieved by cessation of some or all procedures in Category 2 (Appendix 2).

- 9.4 In a more severe shortage where, for example, 50% or more of the red cell supply becomes unavailable it is likely that only patients in Category 1 (Appendix 2) would be treated.
- 9.5 Hospitals/HBs should report adverse incidents in patients with the operation of this plan through local governance systems, SHOT, Serious Adverse Blood Reactions and Events (SABRE) and to the WBS as appropriate. SHOT reporting criteria can found on the SHOT UK website.<sup>10</sup>
- 9.6 During shortages the WBS will work collaboratively with hospitals/HBs to monitor red cell usage. It is recognised that hospital caseload and case-mix will vary but where hospitals are unable to meet the recommended reductions in stockholding and use, the haematologist with responsibility for blood transfusion and/or the Transfusion Laboratory Manager will be expected to discuss the hospital needs with a WBS Consultant.
- 9.7 The WBS Blood Health Team (BHT) will work closely with the Hospital Transfusion Teams, and HBs to support and share PBM and prudent management principles.

## 10.0 Recovery from shortages

- 10.1 The WBS will use the Blood Shortage Alert protocol to communicate changes in red cell stock levels and inform when hospitals can move to Amber, Pre-Amber or Red status back to Green. The recovery alert should be communicated to all relevant staff.
- 10.2 The Hospital Transfusion team will disseminate the information as above. The WBS Emergency Planning Group (EPG) and the HB Business Continuity Group should convene at the earliest opportunity to review the effect of the blood shortage and amend the local arrangements as necessary.
- 10.3 Recommendations, lessons learnt, or impacts experienced during the shortage alerts should be collated and a debrief should be held with hospitals to discuss. The report should also be fed back through the Hospital Transfusion Committees as appropriate.
- 10.4 All hospital SHOT reports submitted as a result of blood shortages should be reviewed for recommendations and lessons learnt.

## 11.0 References

1. Health Board Blood conservation measures letter: <https://wbs-intranet.cymru.nhs.uk/bht/wp-content/uploads/sites/4/2021/12/Conservation-letter-Final-Nov-21.pdf>
2. CONTINGENCY PLANNING - AN INTEGRATED PLAN FOR THE MANAGEMENT OF BLOOD SHORTAGES
3. Platelet Shortage plan – In Progress
4. Civil Contingencies 2004 <https://www.legislation.gov.uk/ukpga/2004/36/contents>
5. Blood Health Plan: <https://gov.wales/sites/default/files/publications/2021-09/nhs-wales-blood-health->

[plan.pdf#:~:text=The%20Blood%20Health%20Plan%20%28BHP%29%20has%20been%20deve  
loped,strategic%20aims%20can%20be%20defined%20as%20follows%3A%201.](#)

6. NBTC Ind codes (<https://www.transfusionguidelines.org/uk-transfusion-committees/national-blood-transfusion-committee/responses-and-recommendations>  
& NBTC Blood Component App: <https://apps.apple.com/gb/app/blood-components/id1221434626>
7. Management and Use of O D Neg Red Cells: [https://wbs-intranet.cymru.nhs.uk/bht/wp-content/bht-uploads/sites/4/2022/01/All-Wales-Guidance-for-the-Management-Use-of-O-D-Neg-Red-Cells\\_v2\\_Dec-2021.pdf](https://wbs-intranet.cymru.nhs.uk/bht/wp-content/bht-uploads/sites/4/2022/01/All-Wales-Guidance-for-the-Management-Use-of-O-D-Neg-Red-Cells_v2_Dec-2021.pdf)
8. Doughty, H., Green, L., Callum, J. and Murphy, M. (2020). Triage tool for the rationing of blood for massively bleeding patients during a severe national blood shortage: guidance from the National Blood Transfusion Committee. *British Journal of Haematology*.  
<https://onlinelibrary.wiley.com/doi/10.1111/bjh.16736>
9. National Advisory Committee on Blood and Blood Products, Canada.  
<https://nacblood.ca/resources/shortages-plan/emergency-framework-final.pdf>
10. SHOT UK: <https://www.shotuk.org/reporting/>

## 12.0 Useful Documents

Haematological management of major haemorrhage: (a British Society for Haematology Guideline First published: 10 June 2022 <https://doi.org/10.1111/bjh.18275>)

South Wales Trauma Network (2020). Damage Control Resuscitation (Adult Major Trauma Patients): Clinical Guideline CG07.

Emergency preparedness, resilience and response guidance for UK hospital transfusion teams  
<https://pubmed.ncbi.nlm.nih.gov/32020684/>

Preoperative patient blood management during the SARS – CoV-2 pandemic  
<https://b-s-h.org.uk/guidelines/guidelines/gpp-preoperative-patient-blood-management-during-the-sars-cov-2-pandemic/>

*Clinical Guide to surgical Prioritisation from Federation of Surgical Specialty Association*  
<https://fssa.org.uk/userfiles/pages/files/covid19/prioritisationmaster280122.pdf>

## 13.0 APPENDICES

- Appendix 1 Summary of Blood Shortage Categories and Actions
- Appendix 2 Indication for Transfusion
- Appendix 3 Proposed Actions for HBs/hospitals at each Alert Phase
- Appendix 4a Emergency Framework for Blood Rationing in the context of severe national shortage – Algorithm for Triage Team (Part 1)
- Appendix 4b Emergency Framework for Blood Rationing in the context of severe national shortage – Algorithm for triage Team (Part 2)
- Appendix 5 BHNOG Blood Shortage Group Terms of Reference
- Appendix 6 PBM guidance

## Appendix 1: Summary of Blood Shortage Categories & Actions

WBS STATUS LEVEL	WBS BUSINESS STATUS	RISK to WBS SERVICE	WBS CONTINUITY PLAN	WBS COMMUNICATIONS	HEALTH BOARD (HB)/HOSPITAL RESPONSE / ACTION
<b>GREEN</b> >7 days	<b>Normal operations</b> - Target blood stocks maintained	Collections & manufacturing in line with anticipated demand	<b>Supply aligned to demand.</b> Monitor blood stocks and increase specific 'blood group' collections to maintain stock levels where necessary.	WBS activate donor communications in line with targeted groups	Normal operational status. Hospitals expected to send daily stock updates to WBS
<b>PRE - AMBER</b> <3 days	<b>Hospitals notified of anticipated shortage</b>	Forecasts indicate that stock will come under pressure; negotiations for stock management may occur to avoid increased pressure and escalation to an amber alert	<b>Pre-Amber shortage declared.</b> Review stock levels held in Health Boards.  Compare total stocks with forecast demand and inform HBs of position negotiating where appropriate.  WBS will supply targeted information on usage.  Emergency Planning blood shortage group meeting held, monitored/escalations via daily Resilience Meetings  Increase targeted publicity / recruitment activity.  Targeted information on usage will be supplied by WBS.  Discuss mutual aid with other UK services	Blood shortage alerts to be sent to:  Hospital/HB Transfusion teams via agreed alert procedure  Internal WBS contacts  HB Emergency Planning Leads  Medical Directors  CEO/MD VUNHST	HBs are advised that WBS stocks are under pressure.  Hospitals should aim to maintain stocks at their optimum levels or aim for a reduction of 10% if possible.  Negotiations on orders of components under pressure are likely to occur.  Hospitals are required to send daily stock updates to BSMS Vanessa platform by 9.30 am.  Follow advice on pre-Amber alert including implementation of patient blood management and appropriate use principles
<b>AMBER</b> <2 days	<b>Blood Stock(s) depleted.</b>  WBS has reached 2 days or less in (A & O) blood groups	Unable to recover or increase collection capacity to meet demand in coming days.  No ability to import.	<b>Amber Shortage declared.</b> Increase publicity / recruitment activity.  Hold additional or extended blood collection clinics where possible. Extend shifts in laboratories to increase manufacturing/testing as appropriate.  Discuss mutual aid with other UK Blood Services  Increased monitoring of stock ensuring distribution by age to reduce wastage. Issues/requests may be triaged by WBS consultants.  Daily Emergency Planning group meetings  The BHNOC BSG to review and agree stock holding levels for major trauma centres	Alerts to be sent to:  Hospital/HB Transfusion Teams via agreed alert procedure & weekly meetings  Internal WBS Contacts  HB Emergency Planning Leads  Medical Directors  Welsh Government  CEO/MD VUNHST	Hospitals should aim for a minimum reduction of 10% in optimum stock levels.  Hospitals should conserve stocks and WBS will review orders. Rationing may be applied.  HBs should convene a Business Continuity tactical Response Group to manage blood shortages.  Hospitals are required to send daily stock updates to BSMS Vanessa platform by 9.30 am.  Follow advice on Amber alert including implementation of patient blood management and appropriate use principles
<b>RED</b> <1 day	<b>Stock(s) in critical position or Major Incident disruption.</b>	Severe prolonged shortages or imminent threat to the blood supply	<b>Red Shortage declared.</b>  As for Amber alert  WBS will chair an all-Wales meeting to include representatives from Velindre Exec board, health board representatives and Welsh Government	Alerts to be sent to:  As for Amber alert  Daily updates to hospitals	As for Amber alert Hospitals are required to send daily stock updates to BSMS Vanessa platform by 9.30 am. Hospital orders will be managed by consultant discussions and prioritised. A HB Business Continuity tactical Response Group will be activated and respond to notifications from WBS.

## Appendix 2: Indication for Transfusion

To simplify the management of patients in a general red cell shortage a prioritisation system has been created using three broad patient categories. This is to assist hospitals with prioritising patients to achieve the required reduction in red cell usage. It is recognised that clinical judgement is an essential part of decision-making for individual patients.

Non

OPTIMISE ALL PATIENT BLOOD MANAGEMENT STRATEGIES	
<p><b>Category 1</b> These patients will remain highest priority of transfusion.</p> <p><b>RED</b> Phase</p>	<p><b>Resuscitation</b> Resuscitation of life-threatening / on-going blood loss including trauma. If ongoing major haemorrhage with expected poor prognosis review appropriateness of continuing transfusion support</p> <p><b>Transfusion- dependent anaemias including thalassaemia.</b> Review the need for transfusion and delay if not symptomatic with anaemia. Haemoglobinopathy patients on regular transfusion programmes follow amber alert guidance but also increase interval between red cell exchanges or consider using transfusion as interim measure.</p>
	<p><b>Surgical support<sup>1</sup></b> <b>If less than 0.5 days stock</b></p> <p>Priority 1a: *procedures can be supported with donor blood with exceptions** Priority 1b: emergency procedures <b>cannot</b> be supported with donor blood. These should be reviewed on an individual case basis taking into account blood group and correction of anaemia.</p> <p><b>Non-surgical anaemias</b> Continue to transfuse in</p> <ol style="list-style-type: none"> <li>a. life threatening anaemia including patients requiring in-utero support and high dependency care/SCBU.</li> <li>b. Stem cell transplantation or chemotherapy already commenced***</li> </ol> <p>Review cadaveric organ transplants and delay, if possible, particularly if large volume of blood is required e.g. liver/cardiac.</p>
	<p><b>Surgical support<sup>1</sup></b> <b>If 0.5 - 1 day's stock</b></p> <p>Priority 1a &amp; 1b: procedures can be supported which are likely to require donor blood support. These should be reviewed on an individual case basis taking into account blood group and correction of anaemia.</p> <p>Delay starting:</p> <ol style="list-style-type: none"> <li>a. Stem cell transplantation, or chemotherapy</li> <li>b. Living related organ transplantation</li> </ol> <p>Delay prophylactic transfusion:</p> <ol style="list-style-type: none"> <li>a. In severe bone marrow failure syndrome if patient not symptomatic with anaemia</li> </ol>



<p><b>Category 2</b> These patients will <b>not</b> be transfused in the <b>RED</b> phase.</p>	<p><b>Surgery/Obstetrics</b> Cancer surgery (palliative); Symptomatic but not life-threatening post-operative or post-partum anaemia; Urgent*** surgery</p>
	<p><b>Priority 2 and 3 surgeries</b> Consider postponing if likely to require blood. Support on an individual case basis taking into account blood group and correction of anaemia</p>
	<p><b>Non-surgical anaemias</b> Symptomatic but not life-threatening anaemia</p>
<p><b>Category 3</b> These patients will <b>not</b> be transfused in the <b>AMBER</b></p>	<p><b>Surgery</b> Consider postponing priority 4 surgeries if likely to require blood. Support on an individual case basis considering blood group and correction of anaemia</p>
	<p><b>Chronically transfused patients</b></p> <ol style="list-style-type: none"> <li>1. Haemoglobinopathy: Patients on Red Cell Exchange (RCE) programme – <ol style="list-style-type: none"> <li>a. Reassess use of red cells during previous exchanges to ensure optimising red cell component usage.</li> <li>b. If available, use the depletion mode in the apheresis machine if safe to do so and results in less blood use.</li> <li>c. Consider increasing interval for RCE.</li> <li>d. Consider top-up red cell transfusion post partial exchange to reduce number of red cells required.</li> </ol> </li> <li>2. All Patients: (including haemato-oncological patients receiving chemotherapy) Reduce transfusion threshold to 70g/l if no contraindication.</li> <li>3. Maximise Use of all PBM measures: i.e. use of Tranexamic acid, use of cell salvage, optimisation of pre-op anaemia, minimise iatrogenic anaemia by limiting blood sampling</li> </ol>

## 1 Clinical Guide to surgical Prioritisation from Federation of surgical Specialty Association

- \* Emergency – patient likely to die within 24 hours without surgery.
- \*\* With the exception of poor risk aortic aneurysm patients who rarely survive but who may require large volumes of blood.
- \*\*\* Urgent – patient likely to have major morbidity if surgery not carried out.
- \*\*\*\* Planned haemopoietic stem cell transplant or chemotherapy may be deferred if possible.

## Appendix 3: Proposed Actions for hospitals/HBs at each Alert phase

### Green Alert / Phase

Ensure use of Patient Blood Management and the appropriate use of blood as follows:

- Ensure appropriate membership and functioning of Hospital Transfusion committee / Hospital Transfusion team.
- Ensure that effective blood transfusion policies for the appropriate use of red cells are in place, implemented & reviewed.
- Ensure that education and training is provided to all staff involved in the blood transfusion process and is included in induction programmes for new staff as appropriate.
- Send daily stock levels to WBS via BSMS Vanessa platform.
- Consider the establishment of stock sharing between hospital transfusion laboratories to utilise stocks more effectively across HBs.

Ensure the appropriate use of blood and effective alternatives in clinical situations where blood is used as follows:

- Implement relevant guidance on the appropriate use of blood and alternatives.
- Ensure that guidance is in place for the medical and surgical use of red cells and other blood components such as platelets and fresh frozen plasma (FFP)
- Establish local protocols to empower blood transfusion laboratory staff to query clinicians about the appropriateness of requests against local/national guidelines for use.
- Ensure procedures to empower transfusion laboratory staff that appropriate clinical information is provided with requests for blood.
- Implement regular monitoring and audit of usage of red cells, platelets & FFP in all clinical specialities.
- Schedule internal blood shortage exercises and extend the operational response to involve clinicians and decision making.
- In liaison with BHT and Blood Stocks Management System (BSMS) agree optimal and minimal stock holding

### Pre-Amber Alert / Phase

- Ensure Business Continuity response arrangements are in place and that the group can be convened quickly if a potential Amber alert is called.
- Review haemoglobin triggers for red cell transfusions in accordance with PBM guidance.
- Use tools e.g. NBTC Indication codes app for guidance on appropriateness of transfusion, to support clinical decision making and consider transfusion alternatives.
- Support supply chain if requested by WBS to advertise local donation clinics.

#### All patients

- Minimise iatrogenic anaemia (reduce frequency and volume) of samples from patients. Only take if it affects their clinical management.
- Use a restrictive red cell transfusion threshold (Hb 70g/l) unless patient is bleeding, has acute coronary syndrome or is on a chronic transfusion programme.
- Advocate single unit transfusion (or equivalent volumes for children from 1 year or adults with low body weight) in patients who are not bleeding or on chronic transfusion programmes. Reassess the patient clinically after each unit and perform Hb test to determine if further transfusion is required.

#### Surgical Patients

- Ensure patients with anaemia scheduled for elective surgery are properly diagnosed and treated prior to surgery.
- Ensure early pre-assessment of patients in priority Categories 2 & 3 (Ref. appendix 2). Treat deficiencies with appropriate supplements.

- Optimise care of patients in Category P1 with IV iron infusions pre-operatively
- Review pre-op Hb level and expected blood loss. Use tranexamic acid and intraoperative cell salvage (ICS), unless contraindicated in adults if pre-op HB low or intraoperative blood loss greater than 500ml. Record any contraindications.
- Advocate the use of ICS including ensuring access to ICS equipment and appropriately trained staff.
- Use point-of care coagulation testing to guide intraoperative blood component management.
- Consider use of post-operative IV and/or oral iron in anaemic patients to avoid transfusion.

#### **Patients requiring chronic transfusion programmes.**

- Use alternatives to transfusion where appropriate (refer relevant guidelines)
- Review protocols for transfusion used to maintain Hb levels above a target level during curative radiotherapy.

#### **Transfusion Laboratory Teams**

- Hospitals should aim to maintain stocks at their optimum levels or aim for a reduction of 10% if possible.
- Conserve O D Neg red cells for O D Neg patients in accordance with guidelines
- Transfuse group specific red cells wherever possible.
- Ensure regular monitoring and audit of red cells in all clinical specialities.
- Enter hospital stock levels to the WBS daily by 09.30 a.m. via BSMS Vanessa platform
- Accept shorter dated red cells where you are confident, they can be used.
- Start communications with high users about a potential move to Amber and likely consequences of this.
- Actively manage stockholding for optimum use, consider if safe:
  - Reducing reservation period
  - Reducing stock levels in remote fridges or in the case of Remote Issue (RI) disable this function and move to Remote Allocation
  - Reducing levels of irradiated stock and ordering as required
  - Limiting requests for stock phenotyped units, ordering on a named patient basis
  - Stock sharing across health boards
- Report any delays /incidents to SHOT.

### **Amber Alert / Phase**

#### **All Patients**

- Decision to transfuse should be consultant led unless it is an emergency.
- Where component use is prolonged e.g. major haemorrhage, trauma or pre-hospital setting. Review transfusion support to consider the appropriateness of continued treatment.
- Clinical team should liaise with transfusion laboratory to consider supply of components.
- Consideration should be given to reviewing the transfusion trigger for all patients particularly in haemato-oncology or critical care unless contra-indicated.

#### **Surgical**

- Continuation of elective surgery will depend on current stock levels and anticipated demand.

#### **Patients requiring chronic transfusion programmes.**

- As for pre-Amber

#### **Transfusion Laboratory Teams**

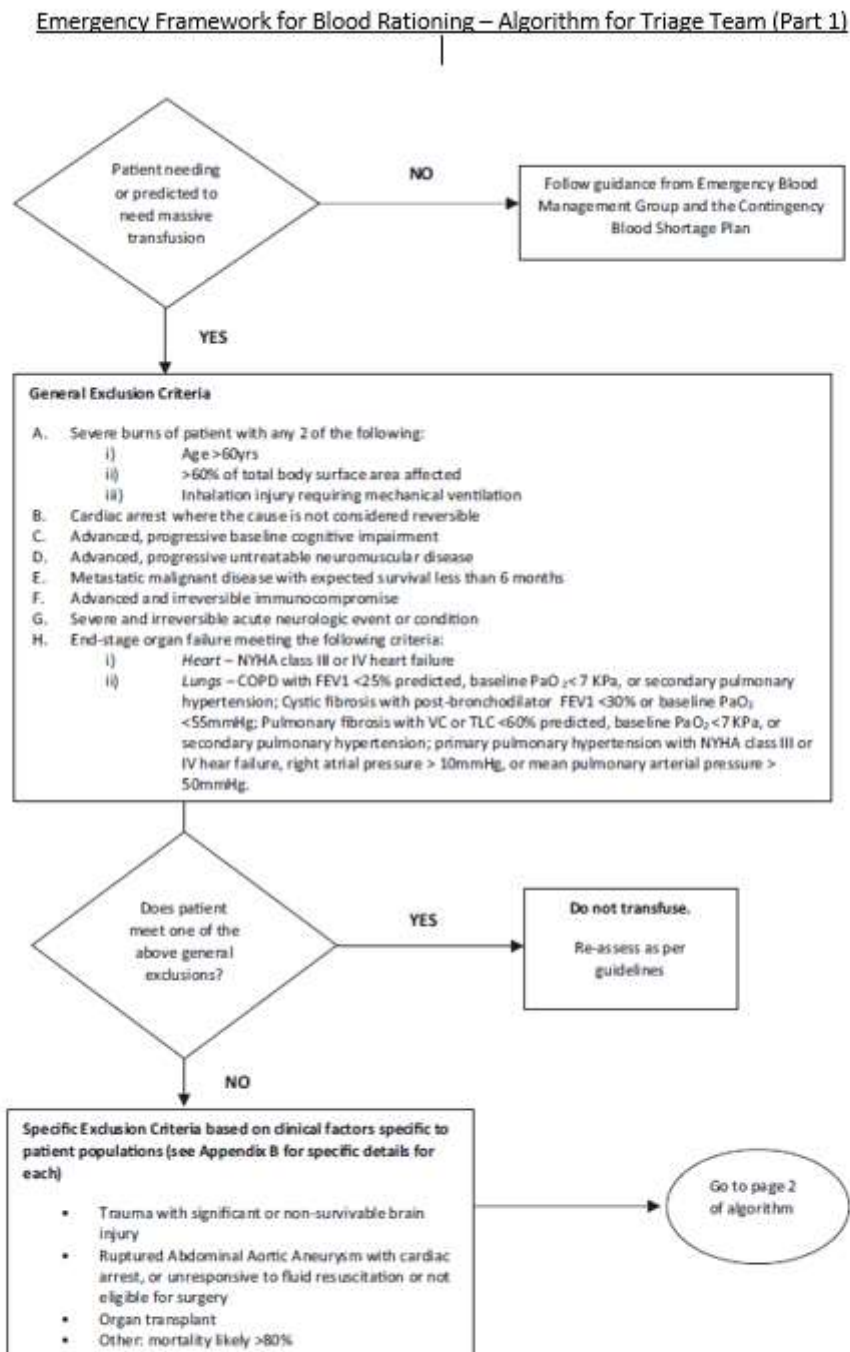
- As for pre-Amber and:
- Reduction of the reservation period wherever possible
- Consider the use of temperature loggers in blood transport boxes where appropriate to reduce wastage because of uncertainty in the cold chain
- Consider further reduction or removal of stock in remote issue fridges especially those used for elective surgery or in the case of Remote Issue (RI) disable this function and move to Remote Allocation.
- Weekly meetings held with Hospital Transfusion Teams/EMRTS/Business Continuity tactical Response Group/EPRR leads as appropriate.

## Red Alert / Phase

- As for Amber and:
- **Mandatory** entry of daily stock levels by 09.30am to WBS via BSMS Vanessa platform
- Reduce stockholding to the level agreed with WBS.
- Reduce usage to the level agreed in collaboration with the WBS.
- Daily review of the blood shortage and impact on patient care by Business Continuity Response Group.
- Assessment of all requests by a Consultant Haematologist to minimise inappropriate requests.
- Consider removal of all red cell stock from remote issues fridges except for emergency units and issue components directly from laboratory or in the case of Remote Issue (RI) disable this function and move to Remote Allocation which is also managed by laboratory.
- Sites with no staff on site laboratory will need to consider transport arrangements to ensure adequate blood component availability.
- Order of priority based on clinical need. Clinical teams are advised to follow the NBTC guidance and triage tool for the rationing of blood for massively bleeding patients during a severe national blood shortage<sup>8</sup> which outlines the algorithm.
- Establishment of stock sharing between hospital transfusion laboratories to utilise stocks more effectively across HBs.
- The enactment of a predetermined policy on dealing with major bleeding that should utilise guidance in this document on when to stop blood component support.

N.B. In both the **Amber** & **Red** phases of alert unless the request is an emergency if WBS is unable to meet a blood request and where no alternative can be found, this will be referred to a WBS Medical Consultant.

## Appendix 4a: Emergency Framework for Blood Rationing in the context of severe national shortage – Algorithm for Triage Team (Part 1)

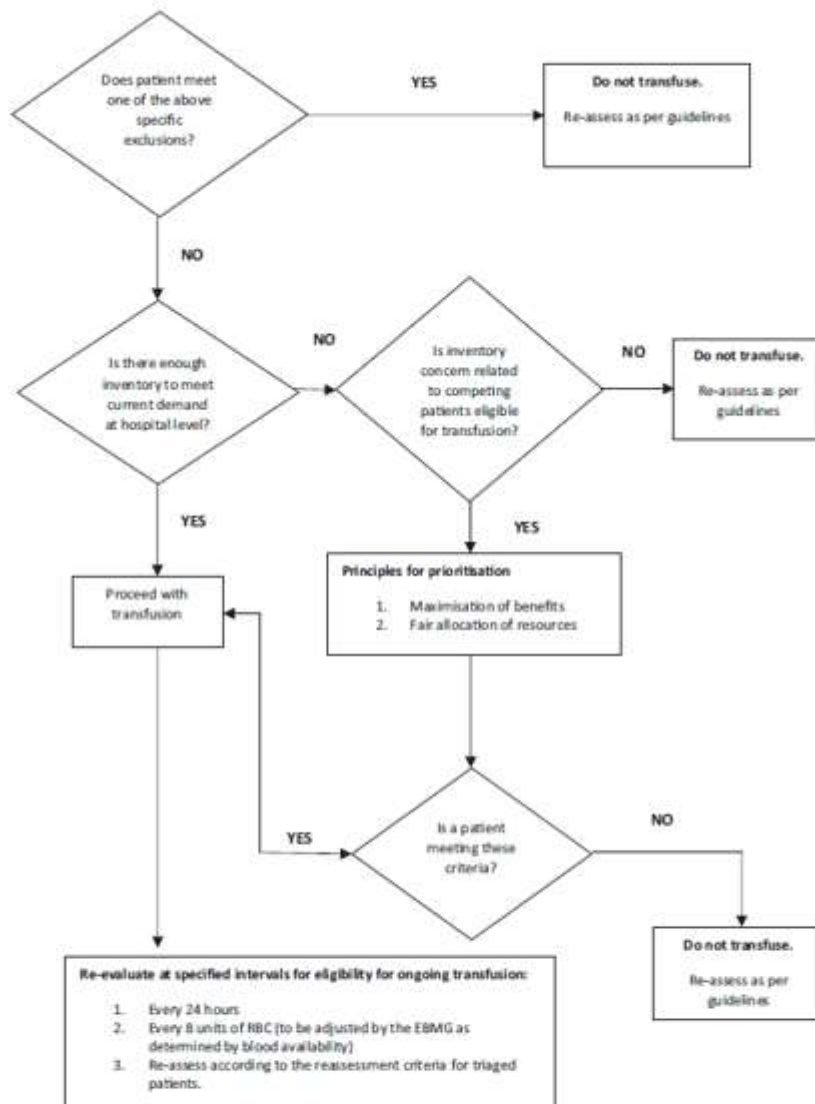


'Specific Exclusion Criteria Based on Clinical Factors' in the box above – further details on this can be found in the full guidance document at <https://onlinelibrary.wiley.com/doi/10.1111/bjh.16736>

Reproduced from Appendix B of *Triage tool for the rationing of blood for massively bleeding patients during a severe national blood shortage: guidance from the National Blood Transfusion Committee.*

## Appendix 4b: Emergency Framework for Blood Rationing in the context of severe national shortage – Algorithm for triage Team (Part 2)

Emergency Framework for Blood Rationing – Algorithm for Triage Team (Part 2)



Reproduced from Appendix B of *Triage tool for the rationing of blood for massively bleeding patients during a severe national blood shortage: guidance from the National Blood Transfusion Committee.*

## Appendix 5: BHNOG Blood Shortage Group Terms of Reference

### 1. Purpose

The Blood Health National Oversight Group (BHNOG) Blood Shortage Group (BSG) was established in response to ongoing challenges within the blood supply chain. These have been particularly evident over the last 12 – 18 months with both the Welsh Blood Service (WBS) and other UK services facing significant challenges securing supply to meet demand. This resulted in the establishment of a group at a national level, comprising of key stakeholders, to facilitate management of the blood supply chain including the appropriate use of blood. Building on established structures and recognising that BHNOG already comprised much of the required membership, the establishment of the BSG, was agreed with reporting to BHNOG. The purpose of the BSG is to work with key stakeholders to ensure the appropriate use of blood using patient blood management principles. If a pre-Amber alert or escalation to an Amber or Red phase / alert does occur that this is effectively communicated and managed within the Health Boards (HBs) using relevant shortage documentation<sup>1</sup>.

### 2. Aim

The aim of the BSG is to escalate, communicate and manage any challenges to the blood supply chain in collaboration with other key stakeholders to avoid blood shortages. This can be applied to any blood components but excludes blood products which would be managed by the Intravenous Immunoglobulin (IVIG) Group. The BSG will ensure any shortages are effectively managed and communicated to clinical colleagues ensuring blood is given to those patients most in need.

### 3. Governance

The BSG is accountable to BHNOG and follows recognised governance pathways defined in the BHNOG ToR<sup>2</sup>.

### 4. Chair

The BSG group will be chaired by current BHNOG chair. A Deputy chair will also be selected from within the group's membership.

### 5. Membership

BHNOG Chair  
Director Welsh Blood Service (WBS)  
Consultant with BHP responsibility/Medical Director WBS  
BHNOG Work Stream Leads  
Blood Health Team (BHT) Lead  
BHNOG Rep for Transfusion Lab Manager Forum  
Welsh Government Representative

The representatives identified in the membership table above will be defined as core members of the BSG. Other members may be co-opted as necessary onto the group at the agreement of the Chair.

### 6. Meeting Frequency

The BSG will meet on an ad-hoc basis and will depend on:

- Information regarding current and predicted stock levels both within in Wales and rest of the UK. This will include analysis of demand, collection activity, availability of mutual aid.
- Any critically identified issues within Wales that could impact on national supply
- Extended alerts or threats to the blood supply with limited ability to improve national stocks.
- Meetings will be convened by the WBS Director or nominated Deputy in liaison with the BHNOG Chair when one of the criteria above has been reached.
- Extraordinary meetings may be convened at the discretion of the WBS director.

#### Administrative Support

BSG is hosted by the WBS, which supports the administration of the meetings. These arrangements allow for organisation of meetings; documenting and maintaining records of all meetings held; and effective communication on behalf of the committee.

## 7. Documentation Required

- Notes of the preceding meeting & action log
- Documentation supporting agenda items e.g. resilience data, demand data, wastage and issuing data etc.

## 8. Remit

- The BSG will work with BHNOG work stream leads and other key stakeholders strategically across Wales to support the blood supply chain both within the transfusion community and across the wider clinical setting
- Work with relevant large blood user clinical groups to support individualised patient blood management in appropriate care pathways; this will encompass developing practices to support safety and minimise the avoidable use of blood transfusion
- If escalation to a pre-Amber, Amber or Red alert does occur that this is effectively communicated and managed within the Health Boards using relevant shortage documentation and established routes of escalation.
- Ensure any shortages are effectively managed and communicated to clinical colleagues ensuring blood is given to those patients most in need.

## 9. References

1. WBS Blood Shortage plan: [https://wbs-intranet.cymru.nhs.uk/bht/wp-content/bht-uploads/sites/4/2020/08/WBS-Red-Cell-Shortage-Plan\\_July-2020\\_final.pdf](https://wbs-intranet.cymru.nhs.uk/bht/wp-content/bht-uploads/sites/4/2020/08/WBS-Red-Cell-Shortage-Plan_July-2020_final.pdf)

2. BHNOG TOR: <https://bhnog.wales.nhs.uk/wp-content/uploads/2021/12/BHNOG-Approved-ToR.pdf>



## Appendix 6: Patient Blood Management Principles

<b>1. Implement best practice conservation measures</b>	
<b>a. Reduce the need for blood</b>	
i. Pre-habillate- (where time allows)	Where expected blood loss >500ml <b>OR</b> the transfusion risk is >10% <b>OR</b> the patient requires a group & save then complete the following: <ul style="list-style-type: none"> <li>✓ Full Blood Count to check for anaemic status</li> <li>✓ If Haemoglobin (Hb) &lt;130g/l check haematinics as per All Wales preoperative Anaemia Pathway</li> <li>✓ Consider intravenous iron if &lt; 8 weeks to surgery.</li> </ul>
ii. Reduce intra-operative blood loss	<ul style="list-style-type: none"> <li>✓ Give Tranexamic acid where indicated</li> <li>✓ Monitor clotting state (where available) using Point of Care coagulation management (e.g. ROTEM/TEG)</li> <li>✓ Measure blood loss and use alternatives wherever possible</li> <li>✓ Use interventions, such as permissive hypotension, determined by patient and procedure.</li> <li>✓ Use cell salvage to achieve a target post-op Hb &amp; reduce allogeneic transfusion</li> </ul>
<b>b. Give blood only when needed</b>	
<ul style="list-style-type: none"> <li>➤ Use the NHSBT Blood Component App. Document the rationale for all transfusions given above guidance threshold (available IOS &amp; Android free of charge) <a href="https://www.bloodcomponents.org.uk/">https://www.bloodcomponents.org.uk/</a></li> <li>➤ Use the British Society of Haematology (BSH) Platelet Summary Guidance <a href="https://b-s-h.org.uk/media/17121/summary-bcsh-platelet-guideline-appendix-1-final-reviewed-may-2019.pdf">https://b-s-h.org.uk/media/17121/summary-bcsh-platelet-guideline-appendix-1-final-reviewed-may-2019.pdf</a></li> <li>➤ Comply with the All Wales use of O D Negative Red Cells Summary Guidance <a href="https://wbs-intranet.cymru.nhs.uk/bht/wp-content/bht-uploads/sites/4/2020/05/O-D-Neg-Guidance-Summary-final.pdf">https://wbs-intranet.cymru.nhs.uk/bht/wp-content/bht-uploads/sites/4/2020/05/O-D-Neg-Guidance-Summary-final.pdf</a></li> <li>➤ Implement weight adjusted red cell guide to prescribe the minimum no. units for non-bleeding adults to achieve a target threshold. This will support single red cell transfusion strategy.</li> <li>➤ Review requirements for transfusion dependant patients</li> </ul>	
<b>2. Match demand with supply</b>	
<ul style="list-style-type: none"> <li>➤ Clinical areas must work in close collaboration with their Senior Management Teams, Hospital Transfusion Teams (HTT) and the WBS to ensure continuity of supply</li> <li>➤ Clinical teams must consider the potential for blood loss, before embarking on any procedure and plan management. Where blood will be required despite the prudent measures outlined above, do not proceed without confirmation that transfusion services can meet requirements.</li> <li>➤ It is recommended this is specifically addressed in all WHO checklist, pre-operative briefings.</li> </ul>	

Education material to support this guidance is available using the Blood Assist App (available on IOS & Android free of charge) <https://www.bloodassist.co.uk/>

Further information can be provided by contacting the Blood Health Team [wbs.bloodhealthteam@wales.nhs.uk](mailto:wbs.bloodhealthteam@wales.nhs.uk) and at the <https://wbs-intranet.cymru.nhs.uk/bht/>