

Guidelines for implementation of a maximum surgical blood order schedule

Prepared by the British Committee for Standards in Haematology Blood Transfusion Task Force (Chairman: D. Voak).

Membership: J.A.F. Napier, F.E. Boulton, R. Cann, R.D. Finney, I.D. Fraser, W. Wagstaff, A.H. Waters & J.K. Wood

Working group: R. Cann, J. Chapman, H. Dodsworth, J.A.F. Napier & A.H. Waters

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Blood transfusion laboratories have experienced gradually increasing work loads without any corresponding increase in trained staff; this has become more acute during the past five years. New procedures to reduce unnecessary work load and stress are vital to improve the efficiency of the service. A reappraisal and rationalization of compatibility procedures (Guidelines for compatibility testing in Hospital Blood Banks, BCSH 1990) and the introduction of maximum surgical blood order schedules are important developments in this respect (Friedman *et al.* 1976; Dodsworth & Dudley 1985; Napier *et al.* 1985; Perrault & Barr 1986).

The Maximum Surgical Blood Order Schedule (MSBOS) is a table of elective surgical procedures which lists the number of units of blood routinely cross-matched for them pre-operatively. The schedule is based on a retrospective analysis of actual blood usage associated with the individual surgical procedure. It aims to correlate as closely as possible the amount of blood crossmatched (C) to the amount of blood transfused (T). The C:T ratio can be used to monitor the efficiency of the scheme.

The introduction of a MSBOS has the following advantages:—

(1) A reduction in crossmatching work load of the blood transfusion laboratory (in some cases in excess of 25%) which allows more time to respond to emergency requests, and also to investigate complex serological problems.

(2) A reduction in the level of stress.

(3) More efficient use of blood stocks and a reduction in wastage due to out-dating.

Correspondence: Dr J.K. Wood, Secretary BCSH, Department of Haematology, Royal Infirmary, Leicester LE1 5WW.

An important factor in the establishment of a MSBOS is the identification of those procedures that can be accommodated by the group, antibody screen and save procedure.

Surgical procedures will normally fall into two categories: (a) those catered for by group and antibody screen only ('G & S'). If the antibody screen is negative, no blood is crossmatched and the serum is saved; and (b) those for which blood is crossmatched according to the schedule.

The system *allows for flexibility*. If patients in the G & S category have a positive antibody screen, antigen negative crossmatched blood must be made available. If the clinical circumstances indicate that extra blood may be required for a particular patient, extra units may be crossmatched. However, exceeding the 'tariff' must be monitored to prevent abuse of the system.

SEROLOGICAL TECHNIQUES

A blood sample from all surgical patients must have a full ABO and Rh D group and antibody screen, as described in BCSH Guidelines for Compatibility Testing in Hospital Blood Banks (1990).

For patients in the G & S category, the serum saved for crossmatching must be accurately labelled and readily accessible. It should be stored at -20°C or below. This stored serum may be used for crossmatching provided the patient has not been transfused in the intervening period.

If blood is required urgently for any surgical patient, blood of the same ABO and Rh D group can be given after crossmatching by the appropriate rapid procedures depending on the time available (BCSH 1990).

CONSTRUCTING THE TARIFF

A draft schedule of expected blood usage (or tariff) for each surgical procedure is produced by analysing the hospital blood usage data. The use of computers greatly facilitates this. It is necessary to analyse data retrospectively for all surgical crossmatch requests over at least a six month period. It is important to collect a sufficient number of each procedure to give a meaningful assessment, and to exclude the exceptional massive transfusion cases that might bias the result. The data should be analysed for each procedure to indicate the number of units crossmatched, the number of units transfused, the percentage used, the C:T ratio and the average number of units transfused for each procedure (see Table 1).

The ideal value for the C:T ratio is 1.0. The higher the value the more blood that is being crossmatched unnecessarily. A realistic objective for surgical procedures is a C:T ratio of between 2 and 3:1, which corresponds to a blood usage of between 30 and 50%.

In constructing the draft schedule, procedures that have a blood usage of less than 30% are allocated to the G & S category. Other procedures are allotted a tariff based on the average number of units transfused.

In drawing up the tariff allowance must be made for local factors that would

Table 1. Example of analysis of transfusion data for some selected operative procedures

Operation	No. of operations	No. of units crossmatched	No. of units transfused	% units transfused	C:T ratio
*TURP	134	292	30	10.2	9.7
Abdominal hysterectomy	93	216	39	18.0	5.5
Colectomy	47	188	87	46.2	2.1

*TURP = trans-urethral resection of prostate.

affect the speed of provision of compatible blood, such as the distance of operating theatres from the blood transfusion laboratory and portering (transport) arrangements. Haematologists responsible for the supply of blood to nursing homes and private hospitals approved for abortion by the Secretary of State should consult the guidelines prepared by the Department of Health (see Appendix I).

An example of a typical MSBOS is given in Appendix II. It should be emphasized that local circumstances and clinical practice may occasionally appear to bias the tariff in favour of some procedures.

IMPLEMENTATION

It is essential from the start to obtain the confidence of the surgical and anaesthetic teams. Initial contact should be made to explain the proposal to introduce a MSBOS and to let them know that data on surgical procedures is being collected and analysed. Once the draft schedule has been drawn up it should be circulated to the surgeons and anaesthetists for discussion. The consultant haematologist should then meet with each surgical team and describe the MSBOS, explain the local arrangements for providing compatible blood quickly in an emergency and negotiate an agreed tariff for their particular speciality for incorporation in the proposed schedule. It should also be explained that the system allows for flexibility as previously described.

The accepted schedule should be distributed to all relevant staff, preferably in a pocket-sized format. Instruction in the use of MSBOS should be part of the induction course for junior medical staff.

Monitoring is required to detect medical staff who disregard the system or who distrust the ability of the laboratory to provide blood in an emergency. Education of recurrent 'offenders' is better than harassment to promote compliance.

REVISION

The schedule should be reviewed regularly and adjustments should be made as necessary for 'fine tuning'. This is much easier to achieve if the laboratory is computerized.

OPERATION

Confidence in the operation of MSBOS and compliance by users depends on the laboratory being able to provide compatible blood whenever it is required, including urgent requests.

- (a) Pre-operative blood samples must be obtained from all patients in the G & S and crossmatching categories. The laboratory will normally set its own time limits for the receipt of blood for grouping and antibody screening before operation. If an irregular antibody is detected, this may delay the provision of compatible blood.
- (b) Serum saved for crossmatching must be accurately labelled and readily accessible.
- (c) Procedures must be clearly defined to enable blood transfusion staff to provide compatible blood safely should an emergency occur during a 'G & S' operation.
- (d) Communication between the operating theatre and the blood transfusion laboratory must be clearly defined. An urgent need for blood during an operation must be promptly reported to the laboratory by the anaesthetist, or his/her deputy. The request must be received by a responsible person in the blood transfusion laboratory, usually a technologist, and acted upon immediately. Adequate details to identify the patient are essential and the degree of urgency must be clearly indicated so that the most appropriate compatibility tests can be carried out in the time available.
- (e) Portering of blood between the laboratory and the operating theatre must have an established priority.

Appendix I

REVISED GUIDELINES FOR ROUTINE BLOOD TESTING AND EMERGENCY BLOOD COVER FOR NURSING HOMES AND PRIVATE HOSPITALS APPROVED FOR ABORTION BY THE SECRETARY OF STATE

1. Pre-Operative Routine Blood Testing for Abortion Patients

1. All patients to be tested and the results to be available at the nursing home or hospital before operation:
 - (a) haemoglobin
 - (b) blood group (A, B, O and Rhesus (D))
 - (c) screen for atypical red cell antibodies.
2. All patients. The blood group to be performed and a sample of serum held in advance by the hospital blood bank or private laboratory which can provide a 24-hour service for crossmatching if required.

Note Facilities should be available to enable screening for such conditions as sickle-cell disorders to be performed where indicated.

II. Blood supplies and other IV fluids required in an emergency

1. Available immediately at the nursing home or hospital:

- (a) Plasma Protein Fraction (minimum 2 units of 500 ml) or Albumin 4/5% (minimum 2 units of 500 ml)

Plasma Protein Substitute (minimum 4 litres)

Crystalloid IV solutions (including dextrose saline and electrolyte solutions)

2. Available immediately or within 15 minutes of requirement

(b) i For all cases:

either two units of O Rhesus-negative blood to be available for use within 15 minutes (either held at the nursing home or hospital or 'ear-marked' for them and held in an adjacent hospital blood bank or private laboratory);
 or, if two units of O Rhesus-negative blood cannot be guaranteed within 15 minutes, two units of blood to be crossmatched in advance, before the operation is performed.

- ii For all cases, found on screening to have atypical red cell antibodies, two units of blood to be crossmatched in advance before the operation is performed.

3. Available if the emergency continues

- (a) Supplies of crossmatched blood should be 'rapidly obtainable' in an emergency (not more than 60 minutes). This time should take into account geographical distance and travelling conditions at the busiest times of the day.

- (b) As described in Section I(2) in all cases serum should be held in advance at the hospital blood bank or private laboratory for crossmatching if required.

4. If the emergency blood supplies available at the home or private hospital have been used up the operation list must be suspended until they have been replaced.

5. The nursing homes or private hospitals should have suitable blood refrigerators solely reserved for blood storage. The supplies of blood should be supervised by a haematologist and made available for recycling if possible.

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Department of Health and Social Security

Alexander Fleming House

Elephant and Castle, London SE1 6BY

tel: 071-407 5522 ext.

GRO-C

Appendix II

EXAMPLE OF A MAXIMUM BLOOD ORDER SCHEDULE PREPARED TO MEET THE NEEDS OF A LARGE TEACHING HOSPITAL

Surgical blood ordering tariff

General Surgery

Cholecystectomy and
 exploration of common duct G & S
 Splenectomy G & S

Laparotomy—planned

exploration G & S
 Liver biopsy G & S
 Vagotomy +/- drainage G & S

Gastrostomy, ileostomy, colostomy	G & S	Neurosurgery	
Oesophageal dilation	G & S	Head injury, extradural haematoma	2
Oesophagectomy	5	Craniotomy, craniectomy	G & S
Hiatus hernia	2	Meningioma	4
Partial gastrectomy	G & S	Vascular surgery (aneurysms, A-V malformations)	3
Oesophagogastrectomy	4	Shunt procedures	G & S
Hepatectomy	4	Cranioplasty	G & S
Mastectomy (simple)	G & S	Trans-sphenoidal hypophysectomy	G & S
Endocrine—		Vascular transformations, posterior fossa exploration	2
Thyroidectomy—partial/total	G & S	Disc surgery	G & S
Parathyroidectomy	G & S	Laminectomy	G & S
Adrenalectomy	3	Spinal decompression for tumours	2
Pancreatectomy—partial/Whipple	4	Peripheral nerve surgery	G & S
Transplantation—		Orthopaedics	
Renal	2	Removal hip pin or femoral nail	G & S
Graft nephrectomy	2	Osteotomy/bone biopsy (except upper femur*)	G & S (2*)
Donor nephrectomy	G & S	Removal cervical rib	G & S
Marrow Harvest	2	Bone graft from iliac crest—1 side (both sides *)	G & S (2*)
Colo-rectal Surgery		Nailing fractured neck of femur	G & S
Rectum—pouch; resection/excision etc.	2	Spinal fusion	2
Intra-abdominal—colectomy etc.	2	Laminectomy	G & S
Rectopexy	G & S	Internal fixation of femur	2
Vascular Surgery		Internal fixation—fibia or ankle	G & S
Amputation of leg	G & S	Arthroplasty—total knee or shoulder	2
Sympathectomy	G & S	—total hip	2
Femoral endarterectomy	G & S	—total elbow	2
Carotid endarterectomy	G & S	Changing hip prosthesis	4
Femoro-popliteal bypass	2	Dynamic hip screw	G & S
Axillo-femoral bypass	2	Urology	
Aorto-femoral bypass	4	Cystectomy	6
Bifemoral bypass	6	Cystectomy and Urethrectomy	8
Aorto-iliac bypass	4	Nephrectomy	2
Aorto-iliac endarterectomy	4	Nephrectomy and Exploration of vena cava	6
Infra-renal aortic aneurysm	6	Open Nephrolithotomy	2
Thoracic or thoraco-abdominal aneurysm	10	Open Prostatectomy (RPP)	2
Ruptured aneurysms	10	TURP	G & S
Cardio-thoracic surgery		TUR Bladder Tumour (large tumour)	G & S
Angioplasty	G & S	Percutaneous Nephrolithotomy	G & S
Open heart operations—		Ureterolithotomy	G & S
CAVBG, MVR, AVR, (redo*)	4 (8*)	Cystotomy	G & S
Bronchoscopy	G & S		
Open pleural/lung biopsy	G & S		
Lobectomy/pneumonectomy	2		
Sternal refashioning	G & S		

Ureterolithotomy and Cystotomy	G & S	Dental	
Reimplantation of Ureter	G & S	Trauma and reconstructions	2
Urethroplasty	2	Obstetrics and Gynaecology	
		LSCS	2
Head and neck		ERPC/D & C	G & S
Major H-N procedures—Laryngectomy etc.	2	Hydatidiform mole	2
Major plastic reconstructions (see Plastic Surgery)		Placenta praevia/retained placenta	2
Other H-N procedures	G & S	APH/PPH	2 (variable)
		Hysterectomy: abdominal or vaginal—simple	G & S
Plastic Surgery		—extended	2
Abdominoplasty	G & S	Wertheim's operation	4
Mammoplasty	G & S	Pelvic exenteration	6
Head and neck reconstructions	2	Vulvectomy (radical)	4
		Myomectomy	2
		Oophorectomy (radical)	4
		Termination of pregnancy	G & S

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