was highest among those aged 45-64 and lowest among people over 64. As might be expected, 23% of social class I, 19% of social class II, and only 2% of social class V had some private medical insurance cover. Insurance cover was negligible among those elderly people classified as social class III and below.

Our study used a randomly selected group of people to provide unique information about who uses private facilities for common elective operations. We investigated changes in the use of private surgery from a cross sectional survey, using reliable surgical histories. We conclude that age and sex have a weak association with private surgery, although this might reflect the small numbers studied. The effects of age and sex were certainly consistent with results of previous research, although most of this has been fairly recent, and we observed these effects through the 35 years between the creation of the NHS and the time of our survey.

Our results on the probability of private surgery by type of operation are consistent with the results of Nicholl *et al*,[3] which might indicate a more lasting relation than they observed in a single year. Our results on social class, however, indicate a stronger relation than interpretation of the data from the General Household Survey seems to indicate. This is perhaps because any insurance cover for the disadvantaged social classes is relatively recent.

Finally, our data suggest that the proportion of private operations is increasing, such that the likelihood of having an operation done privately is five times greater now than it was at the creation of the NHS. This effect appears not to be confounded by age and type of operation. This provides no reliable insights, however, into what will happen in the future.[10]

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Efficiency of use of blood for surgery in south and mid Wales

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The need for blood in hospitals continues to exceed the amount collected by the transfusion services. As a result there may be recurrent blood shortages. In addition, the risk of shortages is also increased because many red cell units are lost through outdating. This waste occurs mainly because of the practice of ordering more blood to cover operations than is needed. Overordering is shown by an excessively high ratio of blood crossmatched to that transfused.[1-4] The risk of waste is increased when there is delay in recrossmatching the blood which is not transfused, so that it cannot then be used for other patients.[5] Unnecessary crossmatching can be reduced by using tariffs or maximum blood order schedules[6] that suggest the appropriate amounts of blood to be crossmatched for various operations. These can be combined with a policy of performing only the blood group and antibody screening procedures for operations which rarely require blood.[1 7 8]

Blood ordering policies that will be accepted should be derived not only from analyses of blood usage rates but also by discussion and agreement between interested parties. The policies can then be used as a guide by inexperienced medical staff to ensure economical and consistent surgical blood ordering practices. Their implementation should reduce blood wastage, alleviate working pressure on blood bank staff, and thereby contribute towards improved safety for patients. Apart from a recently published guide to surgical blood ordering based on experience at St Mary's Hospital,[9] most of the data on tariffs were published several years ago in the USA.[2 6 10] This study was designed to provide an up to date analysis of blood use within hospitals in south and mid Wales serving a population of 2·2 million that might more closely reflect practice within the rest of the United Kingdom.

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Materials and methods

Blood bank records in 17 hospitals in the Welsh region were analysed to show the amounts of blood requested and used for surgical procedures. For each hospital the overall ratio of units crossmatched to units used was calculated. In addition, operating theatre lists were analysed to discover the numbers of any given operation being performed irrespective of whether crossmatched blood was requested. A list was then drawn up of the 68 most common surgical procedures that might require blood transfusion cover, other minor surgical procedures not being considered further.

For each type of operation the total numbers of blood units that were ordered and actually used were counted. From these data we calculated the blood needs that would satisfy over 90% of operative cases. The closest integer value was selected as the provisionally recommended tariff for ordering purposes. When the consumption of blood averaged less than 0·5 unit a case the group and antibody screen procedure was proposed.[8] At least 25 cases of each procedure were counted, except for those less common procedures separately identified.

This provisional tariff was circulated to the 238 consultant surgeons, anaesthetists, obstetricians, and gynaecologists in the 17 hospitals with a request for critical comments regarding the classification of procedures or the tariff totals selected. The final tariff was devised after taking into account the suggestions received. Analysis of the replies allowed more precise definition of certain operations and identification of high risk categories, which were used to assist analysis of further data.

Results

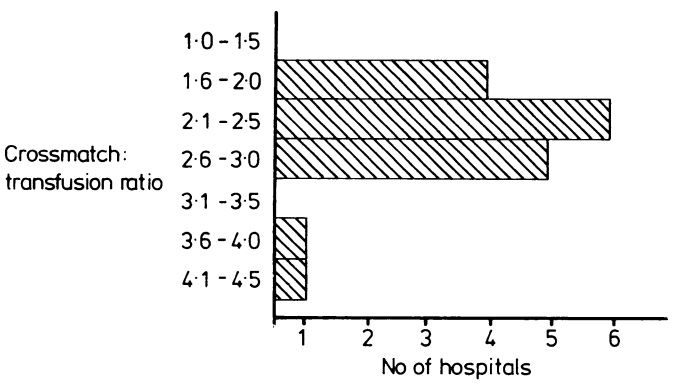
The hospitals studied ranged from a large teaching hospital transfusing over 12 000 blood units annually and providing the full range of routine and specialist surgical services and obstetrics, to smaller hospitals using 1500-2000 blood units every year but still providing comprehensive general facilities. In one of the hospitals blood was used predominantly for gynaecological and obstetric patients.

Practice in the group of hospitals in South Glamorgan serving an approximate population of 0·4 million is fairly typical of the distribution of surgical blood use. Non-surgical transfusions—namely, for haematological patients, medical patients, and various smaller categories—account for around 50% of the total hospital blood use; the remainder is distributed among the surgical specialties—namely, general surgery (26%), orthopaedics (20%), cardiac surgery (18%), urology (13%), obstetrics and gynaecology (10%), arterial surgery (9%), and thoracic surgery (4%).

Blood ordering practices at the hospitals varied widely. Crossmatch: transfusion ratios ranged from 1·3 to 4·2 (fig 1), and seven out of the 17 hospitals had crossmatch:transfusion ratios in excess of the figure of 2·5 suggested by Rouault and Gruenhagen as indicative of excessive blood ordering practices.[2] During the survey 7650 units of blood were crossmatched and 3126 transfused, giving an overall surgical crossmatch:transfusion ratio of 2·5. The six operations associated with the highest crossmatch:transfusion ratios are shown in table I. Caesarean sections had the highest crossmatch:transfusion ratio and were also associated with the greatest variation in the proportion of patients transfused and in crossmatch: transfusion ratios (table II).

Replies to the tariff questionnaire were received from 119 (50%) of consultant staff. These comprised 26 anaesthetists, 29 general surgeons, 24 obstetricians and gynaecologists, 17 orthopaedic surgeons, 11 maxillofacial and ear, nose, and throat surgeons, six urological surgeons, four cardiovascular and thoracic surgeons, and two neurosurgeons.

For 68% of procedures no modifications were necessary to the original tariff figures. Twenty three per cent of procedures were reconsidered after high risk categories had been identified, and an alternative tariff figure listed. The final tariff figure in the remaining 9% was obtained after rounding the original non-integer value upwards to reflect clinical expecta-



Variation in overall crossmatch:transfusion ratios for routine surgery performed in Welsh hospitals.

TABLE I—*Operations associated with highest crossmatch:transfusion ratios in 17 hospitals in Welsh region*

Operation	Highest observed crossmatch: transfusion ratio	Average crossmatch: transfusion ratio
Cholecystectomy	14·5	4·3
Thyroidectomy	14	5·9
Abdominal hysterectomy	47	4·8
Caesarean section	102	9·6
Partial gastrectomy	5·5	2·9
Simple mastectomy	17	5·6

TABLE II—*Variation in crossmatching and transfusion practice for caesarean section operations performed in five hospitals (A-E)*

	Hospital				
	A	B	C	D	E
Patients for whom crossmatch performed (%)	80	89	98	100	100
Patients transfused (%)	62	24	16	6·25	0·98
Crossmatch:transfusion ratio	1·3	3·8	6·3	16	102

TABLE III—*Maximum surgical blood order tariff*

Operation	Blood requirements: Routine tariff group and screening procedure (G+S) or crossmatch (units)	Increased tariff due to clinical considerations	Indication leading to increased tariff *
General surgery:			
Abdominoperineal resection	4		
Bowel resection (including large bowel)	3		
Breast biopsy/lump excision	G+S		
Cholecystectomy	G+S		
Gastrectomy (partial)	G+S		
Gastrectomy (total)	3	4	With thoracotomy
Haemorrhoidectomy	G+S		
Hernia repair	G+S		
Ileostomy (construction of)	G+S		
Laparotomy	G+S	2	Possible malignancy
Liver biopsy	G+S		
Mastectomy (radical)	2		
Mastectomy (simple)	G+S		
Splenectomy (elective and uncomplicated)	2		
Thyroidectomy	G+S		
Vagotomy and pyloroplasty	G+S		
Vein stripping	G+S		
Neurosurgery:			
Carotid endarterectomy†	4		
Craniotomy	G+S	2	Aneurism, trauma, metastatic tumour
Spinal tumours (primary and benign)*	G+S	4	Metastatic tumour
Trephine and burr holes†	G+S		
Maxillofacial and ears, nose, and throat:			
Block dissection of neck	2		
Carcinoma maxilla and tongue	3		
Hypophysectomy†	3		
Laryngectomy†	2	3	Pharyngolaryngectomy
Mastoidectomy	G+S		
Maxillary fractures	2		
Osteotomies (elective)	G+S		
Osteotomies (traumatic)†	2		
Parotidectomy	G+S		
Orthopaedic:			
Amputation (elective)	2		If ischaemic, G+S only
Excision of intervertebral disc	G+S		
Fractured neck of femur	2	3	Pin and plate
Laminectomy	G+S		
Spinal fusion†	3	6	If extensive
Total hip joint replacement	3	4	Repeat procedures
Total knee joint replacement	3		
Urology:			
Partial cystectomy	2		
Total cystectomy	4		
Cystoscopy and transurethral resection of bladder lesion	G+S	2	Larger tumours
Nephrectomy	2		
Nephrolithotomy	2		
Prostatectomy (open)	2		
Prostatectomy (transurethral resection)	2		
Obstetrics and gynaecology:			
Antipartum/postpartum haemorrhage	2	4	Placenta praevia. Abruptio placenta, heavy loss
Bilateral tubal ligation	G+S		
Caesarean section	G+S	2	Placenta praevia, anaemia, blood loss‡
Cone biopsy	G+S		
Dilatation and curettage	G+S		
Ectopic pregnancy	2	4	Acute ruptures with extensive bleeding
Hysterectomy (abdominal)	G+S	2	Neoplasia, anaemia, large fibroids
Hysterectomy (vaginal)	G+S	2	Neoplasia, anaemia, pelvic floor repair
Hysterectomy (radical)	4		
Hysterotomy	G+S		
Manual removal of placenta	2		
Myomectomy	2		
Oophorectomy, ovarian cyst	G+S	2	Carcinoma
Prolapse (repair of)	G+S		
Termination of pregnancy	G+S		
Vulvectomy, radical†	4		
Thoracic surgery:			
Oesophagogastrectomy	4		
Hiatus hernia	G+S		
Pacemaker insertion	G+S		
Pneumothorax	G+S		
Exploratory thoracotomy	2		
Thoracotomy for pulmonary resection	3	4	Reoperations
Mediastinoscopy†	2		
Arterial surgery:			
Aortic aneurysm	6	10-12	Ruptured aneurysm
Femoropopliteal bypass	3		

* Generally, the indications for increased blood needs are anaemia, anticipated finding of malignancy, previous radiotherapy, and repetition of operation.
† Small number of cases surveyed. Tariff reflects majority view of surgeons and anaesthetists.
‡ Crossmatched blood indicated where transfusion laboratory is not located on site.

tions of greater blood needs. Actual blood consumption rates for most surgical procedures at the various hospitals did not show easily discernible differences and this simplified construction of the final list. Caesarean sections and abdominal hysterectomies were pronounced exceptions, the chances of transfusion varying considerably according to the hospital (fig 3). Tariffs were still estimated even when fewer than 25 cases were available for analysis on the assumption that even such provisional guidance would be preferable to none at all. These procedures are identified by an asterisk in the tariff, which is shown in table III. The tariff forms a guide to amounts of blood to be ordered for given operations in the absence of more specific directions from the consultant concerned. Blood requirements in over 90% of the listed surgical procedures can be covered by either a group and screening procedure or by crossmatching the units in the first column. In other cases (as indicated in the third column), the requirements are shown in the second column.

Discussion

Tariff figures determined as in this study provide only a guide that reflects prevailing preferences and patterns of blood use. The clinical validity of these transfusion practices has not been questioned. Use of crossmatch:tranfusion ratios alone may give a misleading impression of the efficiency of blood transfusion practices. High crossmatch:transfusion ratios may be associated with either overcrossmatching or may equally reflect economical transfusion practices. Conversely those hospitals with lower crossmatch:transfusion ratios may be crossmatching for a lower proportion of patients or may simply be transfusing more readily. These alternatives can be distinguished only by reference to the separate totals of crossmatched and transfused blood for all patients subject to the operation concerned.

The overall level of blood use probably reflects both its availability and perceptions of the indications, risks, and benefits of transfusion. These beliefs, which have a profound effect on the amount of blood transfusion activity, are rarely challenged.

Tariff or blood ordering schedules have been shown to have had a beneficial effect on blood wastage rates,[2 11] Some hospitals, including some in this study, have unwritten laboratory tariffs which if grossly and regularly infringed lead to negotiations between laboratory and clinical staff. In others, tariff lists have been worked out by haematologists who have been successful in obtaining varying degrees of agreement and cooperation with surgical and anaesthetic colleagues.

Analysis of crossmatch transfusion ratios (fig 1) and the proportion of patients transfused at the hospitals provided evidence that overcrossmatching is a common problem. The overall figure of 15% for unused blood units returned from these hospitals also pointed to a need for guidance on blood ordering practices. Blood wastage rates partly depend on crossmatch:transfusion ratios. This has been confirmed in a separate study on three other hospitals within the Welsh region.[5] High crossmatch:transfusion ratios for obstetric and gynaecological surgery are particularly common. Transfusion practices for hysterectomies and caesarean sections have been investigated previously with substantially similar conclusions to those in our study.[12-15] Our purpose was therefore to construct a tariff using data from a sufficient number of cases and hospitals to reflect what was normal for current practice within the Welsh region. Clearly, individual hospitals' or surgeons' figures may quite validly differ appreciably from this list. When their efficiency of blood use is shown to be considerably worse than average, however, transfusion practices may be justifiably questioned.

It is hoped that junior medical staff, who are responsible for most ordering, may benefit from the guidance provided by the tariff. Blood ordering tariffs provide only recommendations for routine procedures and may be overridden at the request of senior staff where unusual difficulties are expected.

Agreement and operation of a tariff such as that proposed depend on the confidence of surgeons and anaesthetists that unexpected blood needs will be met rapidly and safely. Blood bank stocks must therefore be adequately maintained. There must be prompt attention to calls for blood from the operating theatre, although these should be rare because blood loss in excess of the tariff figure should be uncommon. The recent introduction of rapid low ionic strength compatibility techniques allows provision of fully crossmatched blood as promptly as former emergency procedures. The crucial role of the antibody screening procedure in allowing even uncrossmatched group O or ABO rhesus D compatible blood to be given with safety must be fully understood. Where antibodies have previously been identified, however, strict adherence to a tariff is inappropriate and a generous allowance of blood should be crossmatched.

Even if local agreement cannot be reached over the introduction of a tariff the dialogue between haematologists, surgeons, and anaesthetists over the need for economies in blood use can only be beneficial. Blood that is saved from waste is available for transfusion in other cases, thus lessening the likelihood of cancelled surgery as a result of blood shortages.

We thank the many consultants and blood bank staff throughout the hospitals in the Welsh region for so helpfully cooperating with the accumulation of these data.

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Some people complain of producing more flatus as they grow older. Is this a recognised phenomenon and if so what is the cause and what advice should the complainant be given?

There is no evidence that people produce more flatus as they get older. Work by Bond *et al* suggests that the amount of methane in flatus remains remarkably constant throughout adult life in methane producers[1] but only one third of the normal adult population do produce methane and it does not exceed 25% of the volume of their flatus. Nevertheless, several adult patients do complain of excessive gas or flatus. Lasser's study suggests that these patients do not have excessive intestinal gas but that some may have an intestinal motility disorder with an abnormal pain response to gut distention which leads to bloating and abdominal discomfort perhaps relieved by passing flatus.[2] Diverticular disease becomes commoner with increasing age and this may be associated with abnormal colonic motility. In those who do produce excessive flatus (the average is 200-2000 ml a day or the passage of flatus 14 times a day) the usual cause is ingestion of unabsorbable carbohydrate. Aerophagy or malabsorption are rarer causes. Many patients who complain of excessive flatus are anxious that they may have serious bowel disease but this is rarely the case and investigation of such patients is generally fruitless. If there is no evidence of underlying disease then the best action is reassurance and advice to avoid foods such as beans, legumes, sprouts, artichokes, and the like. There is no evidence that drug treatment is helpful.—JAMES COX, senior registrar in general medicine, Hull.

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