NHS National Services Scotland

Scottish Audit of Surgical Mortality

Annual Report 2010

Reporting on 2009 data

Scottish Audit of Surgical Mortality
SASM
promoting trust
promoting change

Contents

Foreword

I am delighted to introduce this annual report on the work of the Scottish Audit of Surgical Mortality (SASM). This report is of the activities and outcomes for 2009.

I have now been chair of the SASM board for a year. This has coincided with extremely challenging times, due to retirements, promotions, ill health and maternity leave. Virtually the whole of the current SASM staff have been in post for less than one year. Despite all of this, I am delighted in the way the new members of staff have adapted and kept SASM moving forward, in particular the effort that has gone into the development of eSASM.

eSASM is an electronic web based portal which will offer clinicians constant access to their individual cases, provide more timely reporting, guidance relating to the completion of pro forma to minimise subjectivity and real time validations. After many years of false starts this is now a reality and will be in place at the start of the New Year.

Mr Ian Anderson
President of the Royal College of Physicians and Surgeons (Glasgow)
Chairman of SASM Board

Update

Earlier this year, Information Services Division's (ISD) senior management took the operational decision to temporarily suspend the SASM process. The suspension arose from a review of SASM by ISD's Caldicott Guardian and her colleagues on the Privacy Advisory Committee. The advice was that to comply with confidentiality guidelines, all SASM pro forma should be double wrapped and mailed via recorded delivery, which was not financially viable. The Information Services Division of National Services Scotland remains committed to SASM and are working with clinicians to enable the external peer review of surgical deaths to resume as soon as possible.

An electronic version of the audit (eSASM) has been developed:

eSASM Project Plan

- User Acceptance Testing by SASM office staff and Management Committee ongoing
- Piloting in the clinical setting will commence in September/October 2010
- Plan for system to be live as of January 2011

eSASM Benefits

- Constant access for clinicians to their individual cases
- More timely reporting
- Pro forma completion guidance to minimise subjectivity
- Real time validation at the point of data entry along with ongoing central office validation which should have a considerable effect on data completion

End User Survey

This transition from a paper to electronic system is the ideal time to reflect on both the accomplishments to date and the future requirements of the audit. We plan to conduct an end user survey of SASM participating clinicians. In this way we can ensure that we deliver robust, relevant data to clinical staff, thus facilitating continuing improvement in the quality of patient care.

Review of Methodology

The National Clinical Data for Quality Improvement Advisory Group has asked SASM to review its methodology in order to demonstrate continuous quality improvement at local level and to ensure that it is aligned with the recently published Healthcare Quality Strategy for NHS Scotland. The planned end user survey will be invaluable to SASM when undertaking this recommendation.

Methodology

The Scottish Audit of Surgical Mortality (SASM) is a voluntary audit which reviews all deaths which occur in hospital, under the care of a surgeon, regardless of whether an operation was performed or not. The report summarises the findings of the patients' care which have been considered through a peer review process.

- **Inclusion criteria**: Hospital deaths whilst under the care of a surgeon
- **Exclusion criteria:** Obstetric and cardiothoracic patients as these deaths are reported at a UK wide level and utilise a different process from that of SASM

Identifying deaths: SASM are notified of hospital deaths in a variety of ways, e.g. medical records offices, ward clerks, mortuary technicians.

Initiating study: From the above information, SASM office staff identify deaths which occurred under the care of a surgeon and initiate a study for each individual patient separating these into Area A and Area B by geographical place of death.

Responsible consultant: The surgeon responsible for the patient's care at time of death completes a surgical pro forma[1] (sent by SASM staff) and identifies any other clinicians involved in the care i.e. anaesthetist, intensivist, interventional radiologist. SASM then send the appropriate specialty pro forma to the identified clinicians for completion.

1st line assessor: Once all required pro forma are returned, each case is assessed by a consultant of the same surgical specialty but located in a geographical area remote from that of the responsible consultant. This process is repeated in turn for each specialty involved in the care.

If one or more of the 1st line assessors identifies an area of concern/consideration (ACON) or requests a case note review (CNR) the case is referred to the appropriate specialty coordinator(s). The coordinator(s) can either agree or overrule the 1st line assessor's opinion.

2nd line assessor: Case note reviews are conducted by a clinician of the appropriate specialty but located in a geographical area which is remote to where the death occurred. The CNR is then reviewed by the appropriate coordinator who can agree or overrule the opinion of the 2nd line assessor's case note review.

It is apparent from the above methodology that the SASM audit cycle is lengthy. Inevitably there were a number of cases which had not completed the full process at the time of the extraction of data (1st July 2010) used for writing this report. This is also true for previous SASM Annual Reports.

[1] Surgical pro forma include neurosurgery, orthopaedic and paediatric pro forma.

Introduction

In light of the SASM staff changes within the last year we were unable to ensure absolute continuity in the methods used to analyse the data. Consequently, we could not guarantee a direct comparison with previous reports and so the data that follows should be considered as a stand alone report. Improved documentation has been initiated to prevent this issue recurring in future years.

As part of ISD's Disclosure Control Protocol, aggregated data where total numbers are low are required to follow the rules of suppression. This rule is there to protect individuals' identities and to prevent the gain of personal or sensitive information relating to these individuals. Where suppression is required, SASM data has been handled appropriately through various grouping methods.

As described in the Methodology section, deaths are reported to SASM from various sources and we work hard to maintain good communication with our various sources in order to maximise the completeness of data.

In 2009 the total number of inpatient deaths occurring whilst under the care of a surgeon and reported to SASM was 3310, with a total of 1691 cases having completed the full SASM process (51.1%). The overall return rate of surgical pro forma was 2583/3310[2] (78.0%). Of the 2583 audited cases, 1009 patients were identified as having had anaesthesia. The return rate of anaesthetic pro forma was 814/1009 (80.7%).

Of the 2583 audited cases, 1140 cases were reported as having had an operation. Of these 1140 operative deaths, 159 were elective admissions and 900 were urgent or emergency admissions. In 81 cases where an operation was reported, the patient's type of admission was not recorded. SASM also audited 1443 deaths where no operation was reported but the patient died under the care of a surgeon.

We are pleased to introduce the findings of both the Intensive Care Unit (ICU) and Interventional Radiology (IR) pilots which both commenced in January 2009. The ICU pilot project collected information directly from the Intensive Care Units on audited surgical patients. The IR pilot project gathered additional information relating to IR procedures that had been performed on surgical patients who subsequently died.

The introduction of Intensive Care Unit (ICU) and Interventional Radiology (IR) pro forma, which inevitably lengthens the SASM process, may go some way to explaining the lower than usual number of completed cases in 2009. In addition to this methodology change, a high SASM staff turnover resulted in fewer reminders being sent to participating clinicians.

[2] These 2583 returned surgical pro forma reflect the number of 2009 SASM "audited cases".

Section 1 RETURN RATE BY HEALTH BOARD AND SPECIALTY

The total number of deaths reported to SASM in 2009 was 3310. Of these reported deaths, 2583 (78.0%) surgical pro forma were returned by 1st July 2010. The 2583 returned surgical pro forma reflect the number of SASM "audited cases" of which 1691 resulted in "completed cases" (i.e. had completed the full SASM peer review process). The return rate of surgical pro forma has been categorised by Health Board and is shown in Table 1.1.

Table 1.1 Number and percentage of surgical pro forma returned by Health Board

	Total deaths	No. surgical pro forma returned	% surgical pro forma returned
Health Board			
Greater Glasgow & Clyde	1057	793	75.0%
Lanarkshire	432	322	74.5%
Lothian	396	316	79.8%
Tayside	277	197	71.1%
Ayrshire & Arran	266	223	83.8%
Grampian	259	192	74.1%
Forth Valley	205	194	94.6%
Fife	139	112	80.6%
Highland	126	123	97.6%
Dumfries & Galloway	83	58	69.9%
Borders	35	34	97.1%
Shetland	27	11	40.7%
Other Health Boards*	8	8	100%
Total	**3310**	**2583**	**78.0%**

* Other Health Boards includes: Western Isles, Golden Jubilee National Hospital and Orkney.

The return rate of surgical pro forma has also been categorised by specialty, the results of which are shown in Table 1.2.

Table 1.2 Number and percentage of surgical pro forma returned by specialty

	Total deaths	No. surgical pro forma returned	% surgical pro forma returned
Specialty			
General Surgery	2029	1521	75.0%
Orthopaedic	542	459	84.7%
Vascular	289	257	88.9%
Urology	168	131	78.0%
Neurosurgery	141	100	70.9%
Ear, Nose & Throat	53	43	81.1%
Gynaecology & Gynae/Oncology	49	46	93.9%
Oral Maxillofacial	17	15	88.2%
Plastic	12	6	50.0%
Other specialty*	10	5	50.0%
Total	**3310**	**2583**	**78.0%**

* Other specialty includes: Paediatric, Ophthalmology, Thoracic and cases where the specialty was not specified.

Section 2 CONSULTANT INVOLVEMENT

One of the key areas in the assessment of surgical mortality is Consultant involvement in the management of patients undergoing at least one operation. This can be related in the first instance to the preoperative stage (Consultant decision regarding surgery) and secondly, involvement during surgery.

Table 2.1 outlines the level of Consultant involvement in the patient's **first** operation. This consists of both the surgeon and anaesthetist's presence as described on the surgical pro forma.

Table 2.1 Consultant involvement* during first operation (for 1140 audited, operative cases)

	Yes		No		Unknown		Total cases
Consultant Involvement	**No. cases**	**% cases**	**No. cases**	**% cases**	**No. cases**	**% cases**	
Consultant surgeon decided if the first operation was required	1064	93.3%	14	1.2%	62	5.4%	**1140**
Consultant surgeon involved* in theatre during the first operation	947	83.1%	5	0.4%	188	16.5%	**1140**
Anaesthetist present in theatre during the first operation †	951	94.3%	16	1.6%	42	4.2%	**1009**
Where an anaesthetist was present, the anaesthetist was a Consultant	800	84.1%	151	15.9%	0	0%	**951**

* Consultant surgeon operating, assisting or immediately available.

† This total (1009) only includes operative cases where an anaesthetic pro forma was required. In the 16 cases where no anaesthetist was present at the first operation, an anaesthetic pro forma was required due to anaesthetist involvement during the second operation.

Table 2.2 provides further analysis of surgeon involvement, according to specialty. Again, this represents information recorded on the surgical pro forma for the **first** operation only.

Table 2.2 Consultant surgeon involvement* in theatre, by specialty (for 1140 operative, audited cases)

	Yes		No		Unknown		Total cases
Consultant Involvement	**No. cases**	**% cases**	**No. cases**	**% cases**	**No. cases**	**% cases**	
General Surgery	518	90.4%	1	0.2%	54	9.4%	**573**
Orthopaedic	224	75.2%	1	0.3%	73	24.5%	**298**
Vascular	106	87.6%	0	0%	15	12.4%	**121**
Neurosurgery	31	53.4%	2	3.4%	25	43.1%	**58**
Urology	28	68.3%	0	0%	13	31.7%	**41**
Ear, Nose & Throat	18	78.3%	1	4.3%	4	17.4%	**23**
Other specialty†	22	84.6%	0	0%	4	15.4%	**26**
Total	**947**	**83.1%**	**5**	**0.4%**	**188**	**16.5%**	**1140**

* Consultant surgeon operating, assisting or immediately available.

† Other specialty includes: Oral Maxillofacial, Gynae/Oncology, Gynaecology, Paediatric, Plastic and Ophthalmology.

Section 3 ACON PROCESS

All data that follows in section 3 refer to cases that have completed the full SASM process.

During the SASM peer review process the assessor / coordinator must assign one of five management descriptions to each case. This management code denotes whether there were any areas of concern or for consideration (ACON) in relation to the patient's management. The management descriptions are defined as:

- There were no areas of concern or for consideration in the management of this patient
- There were areas for consideration but they made no difference to the eventual outcome
- There were areas of concern but they made no difference to the eventual outcome
- There were areas of concern which may have contributed to death of the patient
- There were areas of concern which caused the death of the patient

An area for consideration is where an aspect of care could have been improved, recognising that opinion is subjective and could be an area of debate. An area of concern is where the assessor/coordinator feels that the quality of care provided was sub-optimal.

The ACON is initiated by either the original consultant filling in the SASM pro forma and concurred by the first line specialty assessor, or is raised by the first line specialty assessor. The specialty coordinator then reviews the assessment as a further independent process. In order to know the **final** management description, the SASM process must be complete.

In the majority of cases there are no issues identified in relation to the management of the patient and no further ACON details are required. Where the assessor/coordinator has recorded a management description that indicates that there has been at least one area of concern or for consideration, then the following information should be recorded:

1. The ACON Code: an alpha-numeric code that describes the ACON; a code book is available from which the most appropriate code is selected. Each ACON code is associated with an ACON Group (e.g. operative, anaesthesia, critical care) and with an ACON Category (e.g. resource, delay, communication).
2. Details of when the ACON occurred (presentation, peri-operative, post-operative).
3. Details of the team that was responsible for the care of the patient at the time the ACON occurred (audited team, other team).

Up to two ACON codes can be recorded on each specialty's assessment pro forma, therefore a case that has a surgical, anaesthetic, ICU and IR pro forma could have up to a maximum of eight ACON codes recorded and a maximum of four final management description codes. However in reality, most cases with an identified ACON have only one or two codes recorded.

An ACON code may not necessarily relate to the direct conduct of a particular specialty. For example, a case at the final stage of anaesthetic assessment may have an ACON coded as "inappropriate placement of patient on surgical ward". Whilst this ACON may have been highlighted on the anaesthetic pro forma, it is not an ACON relating directly to the anaesthetic management of the patient. This scenario can be applied to any pro forma and explains why an ACON code is also associated with a group and a category.

It should also be noted that the assessor/coordinator may decide that the ACON occurred at more than one time (e.g. presentation and peri-operative). He/she may also decide that the ACON should be attributed to both the audited team and another team.

In 2009, 193/1691 (11.4%) completed cases had a final management description (on the surgical, anaesthetic, ICU and/or IR pro forma) that resulted in at least one ACON code being recorded.

- Of the 1140 audited operative cases that were reported to SASM in 2009, 514 (45.1%) completed the full SASM process. Of these 514, 126 (24.5%) cases had at least one ACON attributed to the management of their care at the final stage of assessment.
- Of the 1443 audited non-operative cases were reported to SASM in 2009, 1177 (81.6%) completed the full SASM process. Of these 1177, 67 (5.7%) cases had at least one ACON attributed to the management of their care at the final stage of assessment.

The numbers of patients where the area of concern either contributed to or caused death is very small (Table 3.1).

A case can have up to four final management description codes, depending on the number of specialty pro forma for that case; therefore for the purposes of this analysis the most severe final management description recorded for each case is shown (Table 3.1).

Table 3.1 Most severe final management description code recorded on any specialty pro forma (Surgical, Anaesthetic, ICU and/or IR), where the full SASM process has been completed (1691 of 2583 audited cases)

	Non Operative Cases		Operative Cases		Total Completed Cases	
Final Management Description Statement	**No. cases**	**% cases**	**No. cases**	**% cases**	**No. cases**	**% cases**
There were no areas of concern or for consideration	1110	94.3%	388	75.5%	1498	88.6%
There were areas for consideration but they made no difference to the eventual outcome	53	4.5%	77	15.0%	130	7.7%
There were areas of concern but they made no difference to the eventual outcome	10	0.8%	19	3.7%	29	1.7%
There were areas of concern which may have contributed to death of the patient	4	0.3%	26	5.1%	30	1.8%
There were areas of concern which caused the death of the patient* †	0	0%	4	0.8%	4	0.2%
Total	**1177**	**100%**	**514**	**100%**	**1691**	**100%**

*See: “Caused Death ACONs”, page 12.

† See: Further discussion regarding subjective, retrospective decision making, page 10.

ACONS BY SASM PRO FORMA

Table 3.2 outlines the number of pro forma, by specialty, which had a final management description, resulting in at least one ACON being recorded by that specialty's assessor/coordinator. Note that each case can have up to a maximum of four management description codes, thus the total number of pro forma where an ACON was identified will exceed the total number of cases that have at least one ACON (see Table 3.1).

Table 3.2 Number and percentage of cases where the final management description suggests that at least one ACON was identified, by type of SASM pro forma

	No. pro forma	No. completed cases	% cases
Type of SASM Pro Forma			
Surgical	154	1691	9.1%
Anaesthetic	85	429	19.8%
ICU	12	103	11.7%
IR*	2	39	5.1%

*These IR pro forma are the sample collected during the pilot study.

N.B the same ACON may be recorded by more than one specialty assessor/coordinator for each case.

MOST COMMON ACON

Table 3.3 shows the most common ACONs identified on the surgical, anaesthetic, ICU and IR pro forma, at the final stage of assessment.

Of the 193 completed cases that had at least one ACON identified, 266 individual ACON codes were recorded at the final stage of assessment. Note that each case can have up to a maximum of eight ACON codes, therefore the total number of ACON codes exceeds the total number of cases that have at least one ACON (see Table 3.1).

Where exactly the same ACON code was recorded by more than one assessor/coordinator for each case, the duplicate code(s) was removed from the dataset prior to analysis of ACON codes. This prevented an ACON code being counted more than once for each case and thus artificially inflating the occurrence of a particular ACON code.

Table 3.3 Most common ACON codes (from 193 cases with at least one ACON)

	Occurrence of ACON Code	% Total ACON codes
Description of ACON		
Transfer should not have occurred / Inappropriate admission to a surgical ward	27	10.2%
Admission to wrong specialty or ward	12	4.5%
In retrospect, operation should not have been done	11	4.1%
Inappropriate placement of patient on surgical ward	9	3.4%
Delay to surgery, unspecified	7	2.6%
Communication failure between staff	7	2.6%
Delay in referral by non surgical hospital specialty	6	2.3%
Poor quality fluid balance post operatively	6	2.3%
All other ACONs	181	68.0%
Total	**266**	**100%**

Of the 27 ACON codes related to transfer and/or inappropriate placement on the surgical ward, 18 were for patients with advanced malignancy. This group of patients could have potentially received their end of life care in either the primary care or hospice settings.

Delay in recognition of clinical deterioration

There is evidence that mortality following surgery is influenced more by the quality of management of complications rather than their rate of occurrence (Ghaferi NEJM 2009).

One area of particular interest to SASM is the delay in recognition of clinical deterioration in surgical patients. In 2009 there was a combination of seven ACON codes which identified delays in recognition of complications. In addition there were three cases where poor quality of post-operative care and three where poor resuscitation were identified.

The concept of prompt recognition and management of clinical deterioration is well established, and the promotion of systems designed to deal with such events is an important aspect of the Scottish Patient Safety Programme.

ACON CODES BY GROUP

As described in the introduction to Section 3, ACON codes are associated with an ACON Group. These groups are defined as Anaesthesia, Bleeding/Blood, Critical Care, Diagnosis, Drugs, Endoscopy, Infection, Miscellaneous, Nutrition, Operative, Post Operative Care, Presentation and Resuscitation. The number and percentage of ACON codes associated with each ACON Group are shown in Table 3.4.

Table 3.4 Number and percentage of ACON codes attributed to specific ACON Groups (from 193 cases with at least one ACON)

	Occurrence of ACON Code	% Total ACON codes
ACON Group		
Presentation	60	22.6%
Operative	46	17.3%
Miscellaneous	38	14.3%
Diagnosis	22	8.3%
Post Operative Care	19	7.1%
Anaesthesia	17	6.4%
Critical Care	17	6.4%
Infection	14	5.3%
Bleeding/Blood	8	3.0%
Endoscopy	8	3.0%
Drugs	7	2.6%
Other*	10	3.8%
Total	**266**	**100%**

*The group “other” includes resuscitation, nutrition and awaiting ACON code.

ACON CODES BY CATEGORY

ACON codes are also associated with an ACON Category. ACON categories are defined as Commission, Communication, Delay, Omission and Resource. The number and percentage of ACON codes associated with each ACON Category are shown in Table 3.5.

Table 3.5 Number and percentage of ACON codes attributed to specific ACON Categories (from 193 cases with at least one ACON)

	Occurrence of ACON Code	% Total ACON codes
ACON Category		
Commission	102	38.3%
Omission	71	26.7%
Delay	50	18.8%
Resource	21	7.9%
Communication	18	6.8%
Unknown - ACON awaiting code*	4	1.5%
Total	**266**	**100%**

* There are four cases included in Table 3.5 where no final ACON code was agreed at the final stage of assessment, despite the case having been identified as having areas of concern or consideration.

ACON CODES BY TIME AND TEAM

As described in the introduction to Section 3, the assessor/coordinator should attribute an ACON code to a time of occurrence (presentation, peri-operative, post-operative) and to a care team (audited team, other team). The number and percentage of instances where an ACON code was attributed to a particular time/team is shown in Table 3.6.

Note that the assessor/coordinator may decide that the ACON occurred at more than one time and/or should be attributed to more than one team. For this reason, the total number of **instances** where an ACON code is attributed to a particular time/team exceeds the total number of **ACON codes**.

Table 3.6 Number and percentage of instances where an ACON code was attributed to a particular team and time (from a total of 266 ACON codes)*

	Attributed to Audited Team		Attributed to Other Team		Total	
Time	**No.**	**%**	**No.**	**%**	**No.**	**%**
Presentation	66	20.8%	93	29.3%	159	50.2%
Peri-operative	65	20.5%	11	3.5%	76	24.0%
Post-operative	58	18.3%	24	7.6%	82	25.9%
Total	**189**	**59.6%**	**128**	**40.4%**	**317**	**100%**

* No time/team data was available for 44 ACON Codes, therefore the percentages shown are based only on instances where the necessary information was available.

In Table 3.6 it can be seen that ACON codes associated with the presentation of the patient are most often attributed to other teams. Where the responsible consultant identifies other clinicians who were involved in the patient's care, SASM can provide ACON feedback to all identified clinicians.

ACON CODES ASSOCIATED WITH THE "OPERATIVE" ACON GROUP

Of the 266 total ACON codes, 46 ACON codes were classified within the "operative" ACON Group. These are ACON codes which have been identified on any pro forma (surgical, anaesthetic, ICU and IR) and fall within the "operative" ACON code grouping. Table 3.7 provides details of all recorded ACON Codes that were associated with the operative ACON Group.

Table 3.7 ACON codes classified as "operative" (from a total of 266 ACON codes)

Description of ACON	ACON Category	Occurrence of ACON Code	% Total Operative ACON Codes
In retrospect, operation should not have been done	Commission	11	23.9%
Delay to surgery, unspecified	Delay	7	15.2%
Anastomotic leak	Omission	3	6.5%
Better to have performed more extensive surgery	Omission	3	6.5%
Better to have performed more limited surgery	Commission	3	6.5%
Delay to surgery, lack of coordination of care	Delay	3	6.5%
Choice of surgical technique inadvisable	Commission	2	4.3%
Delay to operation, lack of theatre space	Delay	2	4.3%
Delay to surgery, diagnostic problems	Delay	2	4.3%
Perforation of viscus during surgery	Commission	2	4.3%
Technical error during surgery	Commission	2	4.3%
Biliary leak caused by surgery	Commission	1	2.2%
Cerebral damage related to surgical or endovascular procedure	Commission	1	2.2%
Consultant should have been present	Omission	1	2.2%
Delay to surgery, error of surgical team	Delay	1	2.2%
Fistula as complication of surgery	Commission	1	2.2%
Wrong operation performed	Commission	1	2.2%
Total		**46**	**100%**

Table 3.7 shows that the most common "operative" ACON code (11 cases) is an assessment where, in retrospect, the operation should not have been carried out. The decision as to whether to perform surgery can be a difficult process when faced with an elderly patient with significant co-morbidities. The decision should take into consideration various issues, including patient's wishes, quality of life and opinions from surgeons, anaesthetists and intensive care specialists, in order to develop a consensual approach to the problem. Understandably, classifying such cases with ACON codes leads to differences of opinions between local individuals and SASM coordinators. It must, however, be acknowledged that the SASM coordinators reach their decision with the benefit of hindsight that the outcome was death and without the associated patient/carer contribution to the decision making process.

Delay to surgery (7 cases) is usually an "operational issue", with either delay to imaging, surgical opinion being sought or theatre availability. These are important issues to be discussed and addressed at a local level, once the individual hospital data have been issued.

ACON CODES ASSOCIATED WITH THE "ANAESTHETIC" ACON GROUP

As of 1st of July 2010 there were 814 anaesthetic pro forma returned to SASM. Of these cases, 429 (52.7%) had completed the full SASM process and 85/429 (19.8%) had at least one ACON code identified on the anaesthetic pro forma at the final stage of the review process. However, it should be noted that not all ACONs recorded on anaesthetic pro forma were directly related to the anaesthetic management of the patient.

Of the 266 total ACON codes, 17 ACON codes were classified within the "anaesthetic" ACON Group. These are ACON codes which have been identified on any pro forma (surgical, anaesthetic, ICU and IR) and fall within the "anaesthetic" ACON code grouping. Table 3.8 provides details of all recorded ACON Codes that were associated with the anaesthetic ACON Group.

Table 3.8 ACON codes classified as "anaesthetic" (from a total of 266 ACON codes)

	ACON Category	Occurrence of ACON Code	% Total Operative ACON Codes
Description of ACON			
Inadequate pre-operative anaesthetic assessment	Omission	5	29.4%
Anaesthetist too junior	Omission	2	11.8%
Hypotension during general anaesthesia	Omission	2	11.8%
Inadequate pre-operative preparation	Omission	2	11.8%
Technical error during regional anaesthetic	Commission	2	11.8%
Anaphylaxis, inadequate treatment	Omission	1	5.9%
Aspiration during general anaesthesia	Omission	1	5.9%
Hypotension during regional anaesthesia	Omission	1	5.9%
Lack of invasive monitoring	Omission	1	5.9%
Total		**17**	**100%**

CAUSED DEATH ACONS

In 2006 SASM introduced a Clinical Governance Protocol requiring that all 'caused death' cases should be reviewed locally by the responsible hospital and feedback from such meetings, co-signed by the local medical director, should be returned to SASM.

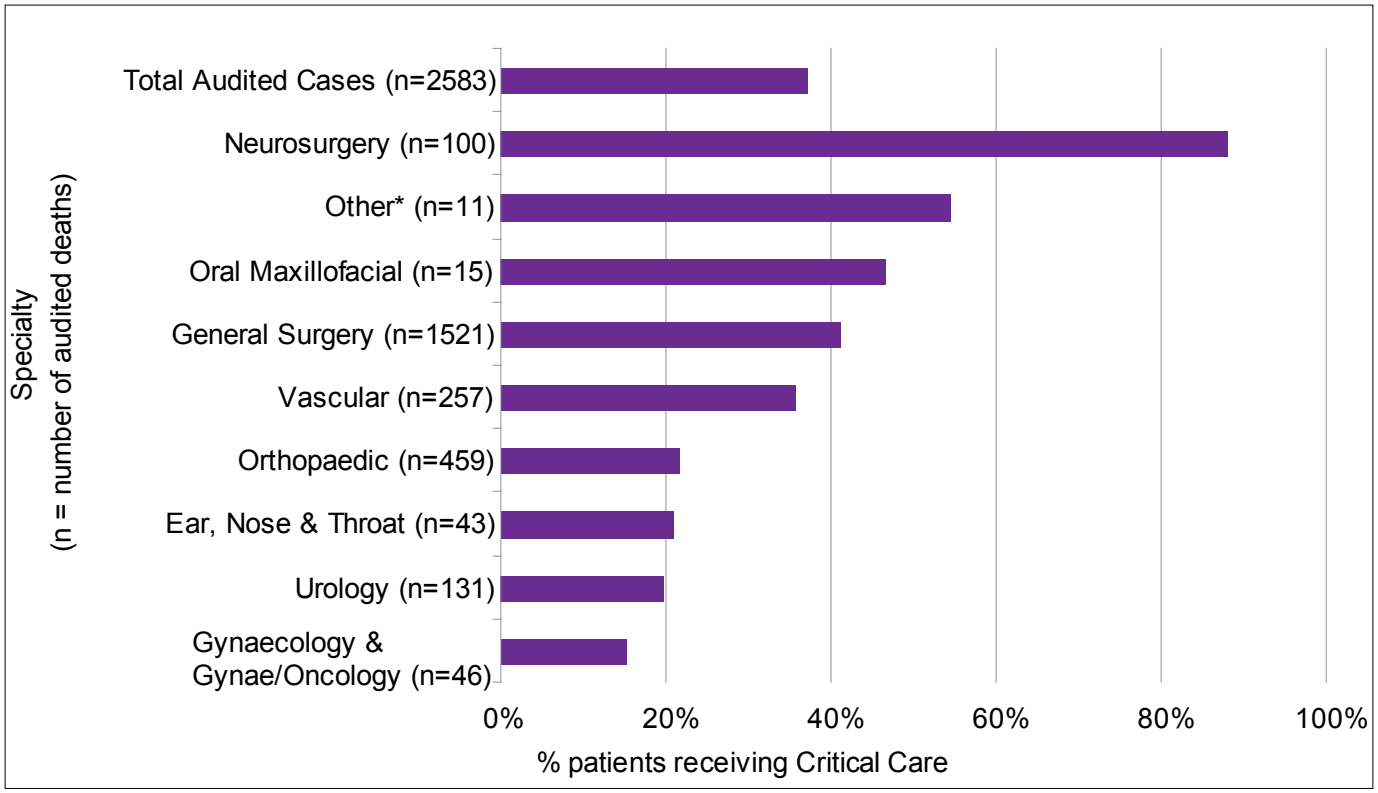
In 2009 there were four cases where the assessors and specialty coordinators registered an ACON which was thought to have caused the death of a patient who would otherwise have been expected to survive. All four of these cases were operative cases, with two being emergency admissions and two elective admissions. These four caused death cases have completed the SASM review process, feedback has been sent to the relevant hospitals and SASM await responses.

Section 4 CRITICAL CARE

Critical Care (Intensive or High Dependency care) continues to play a major part in the management of those surgical patients who die. Out of the 2583 audited cases in 2009, there were 962 (37.2%) cases where the patient received either ICU or HDU care[3], with 270 (10.5%) patients having received care in both HDU and ICU.

There are understandably marked differences between specialties in the use of Critical Care, depending on the patient group (Figure 4.1). For example a greater number of neurosurgical patients will receive ICU care. It may also reflect the number of patients admitted for terminal care within a specialty. The relatively small number of ACONs relating to lack of Critical Care beds suggests that this is not due to unmet need (see Table 4.1).

Figure 4.1 Percentage of patients using Critical Care facilities (from total of 2583 audited cases), by specialty



* Other specialty includes: Paediatric, Ophthalmology and Plastic.

[3] In 78 cases (3.0%) it is not known whether the patient received critical care.

ACON CODES ASSOCIATED WITH THE "CRITICAL CARE" ACON GROUP

Of the 266 total ACON codes, 17 ACON codes were classified within the "critical care" ACON Group. These are ACON codes which have been identified on any pro forma (surgical, anaesthetic, ICU and IR) and fall within the "critical care" ACON code grouping. Table 4.1 provides details of all recorded ACON Codes that were associated with the critical care ACON Group.

Table 4.1 ACON codes classified as "critical care" (from a total of 266 ACON codes)

	ACON Category	Occurrence of ACON Code	% Total Critical Care ACON Codes
Description of ACON			
Failure/delay to utilise HDU	Omission	4	23.5%
No HDU bed available at time of need	Resource	4	23.5%
Failure/delay to utilise ICU	Omission	3	17.6%
No ICU bed available at time of need	Resource	2	11.8%
Clinical management error in Critical Care	Commission	1	5.9%
Critical incident in Critical Care	Commission	1	5.9%
Inappropriate withdrawal of therapy in Critical Care	Commission	1	5.9%
Premature discharge from Critical Care	Commission	1	5.9%
Total		**17**	**100%**

In 2009, there were five cases that completed the full SASM process in which the lack of a critical care bed was considered to be an ACON. (3 HDU, 1 ICU, 1 both). This should be the subject of local review.

As shown in Table 4.1, although the identified ACON code is deemed to be connected to a patient's critical care, the ACON code does not always relate to the actual clinical decision making, but may be resource related.

ICU PRO FORMA PILOT

For the first year SASM has collected information directly from the Intensive Care units on audited surgical patients (298 patients). Initially, SASM set out to gather data on patients who received ICU care at some point during their admission. However, this proved to be logistically difficult so data collection for the ICU pro forma was later limited to patients who had died within ICU.

The following data is a summary of all ICU pro forma (298) returned to SASM in 2009 (as of 1st July 2010) and does include some patients who died after discharge from ICU.

In 163/298 (54.7%)[4] of audited ICU cases the ICU admission was not planned before the start of surgery. In 15/298 (5.0%)[5] cases there was inadequate senior consultation about the referral.

Nearly all 289/298 (97.0%)[6] patients were seen by a consultant within 12 hours of admission.

These figures are considerably better than those found by NCEPOD in 2005 (failure of senior consultation 25% and failure of consultant review 25%) and are close to recommended targets.

In 4/298 cases (1.3%)[7] ICU admission was considered inappropriate.

[4] In 23 cases (7.8%) it is unknown whether the ICU admission was planned before the start of surgery due to incomplete data.

[5] In 97 cases (32.6%) it was unknown whether there was adequate senior consultation about the referral due to incomplete data.

[6] In 6 cases (2.0%) it was unknown if the patient was seen by a consultant within 12 hours of admission due to incomplete data.

[7] In 5 cases (1.7%) it was unknown whether ICU admission was considered appropriate due to incomplete data.

Section 5 HEALTHCARE ASSOCIATED INFECTIONS

SASM data on Healthcare Associated Infections (HAI), although very useful to the peer review process, is by its very nature the subjective opinion of the responsible clinician. There is a national HAI surveillance programme coordinated by Health Protection Scotland (HPS) which uses comprehensive definitions of what is an HAI. We have agreed to consult HPS during any question redesign to ensure, wherever possible, that our future data complements national surveillance definitions.

Section 6 MORBIDITY & MORTALITY (M&M) MEETINGS

SASM strongly believes that the best driver for change is local discussion and hence recommends that all cases are presented at local morbidity and mortality meetings, preferably with multiple specialty input.

Tables 6.1 and 6.2 outline whether cases were discussed at either a hospital multidisciplinary or a local department M&M meeting.

Table 6.1 Number and percentage of audited deaths (2583 cases) discussed at either hospital multidisciplinary or local department M&M meeting, by Health Board

	Discussed already	Will be discussed after pro forma completion	Not discussed	Not known if discussed	Total Audited Cases	% cases discussed or that will be discussed
Health Board						
Greater Glasgow & Clyde	482	182	53	76	793	83.7%
Lanarkshire	146	85	59	32	322	71.7%
Lothian	232	42	24	18	316	86.7%
Ayrshire & Arran	148	38	6	31	223	83.4%
Tayside	102	55	28	12	197	79.7%
Forth Valley	91	60	19	24	194	77.8%
Grampian	79	82	20	11	192	83.9%
Highland	56	50	11	6	123	86.2%
Fife	37	58	11	6	112	84.8%
Dumfries & Galloway	17	34	5	2	58	87.9%
Borders	28	4	2	0	34	94.1%
Shetland	9	1	1	0	11	90.9%
Other Health Boards*	5	2	0	1	8	87.5%
Total	**1432**	**693**	**239**	**219**	**2583**	**82.3%**

* Other Health Boards includes: Western Isles, Golden Jubilee National Hospital and Orkney.

Table 6.2 Number and percentage of audited deaths (2583 cases) discussed at either hospital multidisciplinary or local department M&M meeting, by specialty

	Discussed already	Will be discussed after pro forma completion	Not discussed	Not known if discussed	Total Audited Cases	% cases discussed or that will be discussed
Specialty						
General Surgery	988	331	71	131	1521	86.7%
Orthopaedic	78	238	110	33	459	68.8%
Vascular	141	64	12	40	257	79.8%
Urology	79	32	15	5	131	84.7%
Neurosurgery	100	0	0	0	100	100%
Ear, Nose & Throat	27	12	2	2	43	90.7%
Other specialty*	19	16	29	8	72	48.6%
Total	**1432**	**693**	**239**	**219**	**2583**	**82.3%**
Anaesthetic cases only	137	270	333	74	814	50.0%

* Other specialties includes: Gynaecology, Oral Maxillofacial, Gynae/Oncology, Plastic, Paediatric and Ophthalmology.

As shown in Table 6.2, 100% of neurosurgery cases were discussed at a multidisciplinary M&M meeting. This is due to the fact that SASM neurosurgery pro forma are completed at M&M meetings, hence if a neurosurgery pro forma has been returned to SASM, it will have been discussed at an M&M meeting. SASM would encourage other specialties to adopt this methodology.

Section 7 SASM MORBIDITY & MORTALITY (M&M) PILOT PROJECT

(Report on Ninewells Pilot of Local Assessment of SASM Deaths)

In recent years, there has been a growing opinion within SASM that local discussion of cases is an invaluable part of the review process. Following proposals in 2008 by the SASM Management Committee and support from the SASM Board and Quality Improvement Scotland, a pilot was carried out in Ninewells Hospital involving Anaesthesia and General Surgery. The aim was to compare the results of local assessment of cases presented within a departmental 'morbidity and mortality' forum to those going through the normal 'external review' SASM process. Neurosurgical departments, among others, already discuss all their deaths locally and complete their SASM pro forma as a team, but this proposed system aimed to go a step further and formally assess the management and attribute ACONs as in the standard SASM process. The ultimate aim was to gauge whether, in the future, performing the first-line assessment locally may be an alternative to the current system of external review.

The process of local review proved logistically difficult, particularly for anaesthesia, both in terms of the sheer number of cases requiring assessment and the need for the relevant clinicians, and perhaps the case notes, to be present in order to make a valid assessment.

The number of SASM cases that have been through both local and external assessment processes to allow a comparison proved slightly disappointing, but the vast majority showed agreement in their assessment. As expected, there were a few cases where the assessments differed slightly, but no patterns were visible that would allowed concrete conclusions to be drawn on how the two processes differ.

On the plus side, the local process was undoubtedly educational, providing a reflective process for individuals and the team and, arguably, provided more powerful and timely feedback on local issues that may have required action within that hospital.

As well as difficulties gathering all the appropriate personnel together, concerns were raised at the number of relatively uncontroversial or less educational mortality cases presented during an 'M+M' forum, with the resultant decrease in interesting morbidity cases being presented. The anaesthetists overcame this problem by forming a small (five person) dedicated 'SASM review group' to go through cases and select the more educational or controversial cases for review by a wider audience at a departmental level.

The future of local review of SASM cases remains uncertain. There is a concern that loss of the first-line external review will make the SASM process less robust and may potentially allow issues to be 'swept under the carpet' at a local level. Our limited data suggest this is not the case and, if anything, local review may in fact be more critical than distant, external review. SASM is interested in the role that a 'Local SASM Coordinator' could play here in facilitating such a system of local review, as well as providing support and education for the SASM process as a whole. Such a role would also hopefully improve SASM compliance. Many feel, however, that removal of the first tier of external and objective assessment would fundamentally change the way the SASM process is perceived. External review on individual cases, along with the annual hospital report reviewing departmental performance, is extremely useful in facilitating an appraisal process. However, local review of cases and trends are essential and SASM must continue to encourage this process, but the 'jury is still out' regarding a purely local first-line assessment process.

Section 8 RADIOLOGY PILOT

Many patients under modern surgical care now undergo image-guided interventional radiological (IR) procedures instead of open surgery or entirely conservative management. Examples include the emergency control of haemorrhage, vascular angioplasty and stenting, abscess drainage, the treatment of urinary or biliary tract obstruction and tumour ablation.

In a pilot that started in January 2009, a group of about 40 interventional radiologists agreed to participate in SASM with the intention of acquiring additional information about IR procedures that had been performed on surgical patients who had subsequently died. Information on these procedures had been very limited before this. Three interventional radiologists acted as assessors for the pilot.

By 1st July 2010, 95 pro forma had been sent out and 71, of which 68 have been marked as required for the purposes of the extract analysis, have been returned so far. Of these 68 cases, 39 (57.4%) have completed the full SASM process.

The data from SASM shows two cases where an ACON was attributed to the case at the final stage of **IR** assessment. Assessment of one of these cases resulted in an ACON which may have contributed/caused death and a case note review has been requested. There were five additional cases which had IR involvement and had an ACON at the **final** stage of assessment. None of these were a caused death case.

These events covered a variety of procedures. The largest single proportion of deaths and of ACONs related to percutaneous biliary drainage. This was surprising; particularly as many such patients are under medical (gastro-enterological) care and would therefore not be covered by this audit.

Other issues and areas for consideration from this peer review have been very useful in assessing and considering potential improvements to IR practice and its interaction with other medical disciplines. Some of these cases illustrate the potential benefit but also the potential harm of interventional radiological procedures. IR procedures are often carried out via small (3-4mm) incisions, but the interventions may have been major and the standard of post-operative care needs to be similar to that after open surgery. However access to out of hours emergency interventional radiology is currently available to less than 50% of the Scottish population.

The process has had continuing support from the interventional radiologists involved and now has the support of the Standing Scottish Committee of the Royal College of Radiologists for its extension to all Scottish radiologists from 2011.

ACKNOWLEDGEMENTS

I would like to thank Helen Burton and Gillian McPhillips, the previous National Clinical Coordinator and Senior Analyst respectively, for their support over the years. Helen is now enjoying a well earned retirement while Gillian has moved to a promoted post within the Systems Interface Group of ISD.

I would also like to thank present and past members of the management committee for their continued enthusiasm and support, in particular George Gray, Heather Hosie and Charles Wallis who have made major contributions to the audit's success over the years. SASM appreciates the hard work and dedication of all the contributors to the audit including clinicians, administrative and support staff.

Finally, as usual my thanks go to those of the SASM team within ISD. The past year has seen significant changes in personnel; I thank those who have left and welcome all the new staff.

Dr Nick Pace
Chairman, SASM Management Committee

APPENDIX

BLEEDING AUDIT (2008 DATA)

Dr Charles Wallis (Consultant Anaesthetist), Dr Marc Mifsud (Anaesthetic Specialist Registrar), Mr Douglas Watson (SNBTS), Lynsey Kerr (Analyst, ISD)

A time limited audit was carried out of surgical deaths in 2008 where bleeding was involved. The aim was to characterize incidence and extent of bleeding, anaemia and coagulopathy occurring in patients who die following surgery, and to look for areas of practice, good and bad, that may have influenced the course to death.

Data were obtained by a structured, detailed case note review of cases selected following a two stage process; a screening question and SASM form review. Non operative cases were not included.

In 2008 SASM identified 3461 deaths of which 1323 operative deaths were audited by 1st July 2009. In 344 (26%) of those deaths significant anaemia and /or major haemorrhage was indicated by any "yes" in part 2 or 4 of the screening question (Question 19) inserted in the anaesthetic form, as shown in Table A.1.

Table A.1 Wording and results of screening question in Anaesthetic SASM forms. In 344 cases there was a "yes" to either or both parts 2 and 4 of the question.

	Question 19	Result
Part		
1	What was the patient's pre-operative haemoglobin in g/dL? Median (range)	10.5 (2.9-17.4)
2	Did the patient's haemoglobin drop below 8g/dL at any time?	yes in 303 patients
3	If yes, what was the lowest recorded haemoglobin? g/dL Median (range)	6.8 (2.9-9.7)
4	Did the patient suffer a major haemorrhage, defined as requiring >4 red cell units during a 24 hour period, at any time during their hospital stay?	yes in 160 patients

Both SASM forms for these 344 cases were reviewed by one experienced SASM assessor looking for evidence of any of the following problems: significant bleeding, surgical difficulties with bleeding, severe anaemia, coagulopathy, significant use of blood products or problems with their supply. Using this method 121 cases were selected for detailed case note review and data is available for 76 of these to which the rest of this report refers. The case note reviews were carried out by an Anaesthetic Specialist Registrar (SpR).

Patient Population

The mean (range) age of the patients was 74 (29 – 97) years of which 62% were male. Only 4% of patients were classified as elective admissions to hospital, the remainder were urgent or emergency admissions.

Blood Results

Table A.2 shows haemoglobin values taken from the case notes, where available for various time points. This shows that median haemoglobin fell from 11.45 g/dL at admission to a nadir of 7.5 g/dL intra-operatively and tended to recover post-operatively. The lowest haemoglobin recorded was a pre-operative value of 2.9 g/dL and the ranges also reveal low haemoglobin values at other time points.

Table A.2 Haemoglobin (g/dL)

	Admission	Pre-op	Intra-op 1	Intra-op 2	Post-op day 1	Post-op day 2	Post-op day 3	Lowest sub-sequent	Lowest recorded
Number of values	54	69	25	8	49	42	24	21	65
Median	11.45	10.7	7.5	7.45	8.8	10.1	9.55	8	6.4
Range	5.1 - 16.2	2.9-17.4	3.5-12.2	4.3-10.3	4.5-14.1	5.8-14.5	6.5-12.9	5.1-12.9	2.9-9.1

Platelet Count and Coagulation Test

Tables A.3 and A.4 show the platelet count and coagulation tests at various time points where available. Like the haemoglobin values, platelets tended to drop significantly during the operation and then recover. Interpretation of coagulation results is difficult due to small numbers of values in the case notes and the fact that hospitals across Scotland express coagulation results in different ways. Results are expressed as the percentage of International Normalized Ratios (INRs) greater than 1.5 or prothrombin time (PT) greater than 15 seconds. During the intra-operative phase up to 80% of prothrombin times were prolonged.

Table A.3 Platelet Counts expressed as 10^9/L

	Admission	Pre-op	Intra-op	Post-op day 1	Post-op day 2	Post-op day 3
Number of values	45	29	21	47	40	24
Median Platelet count	199	241	67	107	124	91
Platelet Count, range	43 -716	42-409	32-355	21-406	25-509	41-356

Table A.4 Coagulation tests (INR and PT in seconds)

	Admission	Pre-op	Intra-op	Post-op Day 1	Post-op Day 2	Post- op Day 3
INR Number of values	19	7	7	15	13	7
% > 1.5	15.8	0	43	53	39	43
PT Number of values	18	7	10	20	10	8
% PT > 15s	22.2	57	80	55	40	25

Blood Loss

Blood loss was recorded in only 37/76 (47.4%) of the case notes reviewed.

Mean blood loss was 4700mls (median 2700mls, range 200 – 16,000mls). In 26 cases blood loss was less than 5,000 mls, in 7 cases 5,000-9,999mls and in 4 cases 10,000mls or greater.

Use of Blood Products

Table A.5 shows that transfusion of red cells (RCC) was considerable with a mean of 8.9 units given to each patient. Mean fresh frozen plasma (FFP) use was also clinically significant at 2.9 units per patient, but platelet use was lower.

Table A.5 Use of blood product units, during and after surgery

	RCC	FFP	Platelets
Total	680	223	51
Mean	8.9	2.9	0.7
Range	0-29	0-15	0-3

Time of Death after Surgery and Ischemic Heart Disease

Sixty two patients (82%) had a single operation and 14 (18%) had a second operation prior to death. The median (range) time from the last operation to death was 8 (0-121) days. Mean blood loss, where recorded, was 5,578mls for the 20 patients who died on day 0 or 1 post operatively and 3,403mls for the 56 patients who died more than one day post operatively. Ischaemic heart disease was documented in the case notes of 34/76 (45%) of patients. There was evidence of a myocardial infarction in 11 patients.

Quality of Care

The following are examples taken from the case notes and SASM forms where problems were noted. Some of these will based on retrospective comments by surgeon or anaesthetist on the SASM forms about management of the case.

- Patient transferred to theatre, blood left behind and arrived 30 minutes later.
- Patient transferred to theatre but blood left behind in A/E. Led to review of local blood ordering procedures.
- Delay in portering blood to theatre.
- Delay in activating major haemorrhage protocol.
- Failure to cross match pre-op. Lowest haemoglobin 3.3g/dL while waiting for blood. No coagulation tests.
- Patient taken to theatre but surgeon did not know that Clopidigrel was given by medical team for suspected acute coronary syndrome. Surgeon notes that platelets and fresh frozen plasma not supplied fast enough.
- No coagulation results available in theatre, coagulopathic patient.
- Delay to transfusion as haemoglobin of 5.8g/dL not believed. Anaemia caused chest pain.
- Lack of near patient testing. Haemoglobin of 5.5g/dL in head injury, delay to transfusion was an adverse event.

There were also examples of good practice documented, such as the use of cell salvage (four cases), near patient testing of haemoglobin (15 cases), thromboelastography (three cases).

Conclusions

This audit shows that significant anaemia or major haemorrhage occurs in about a quarter of all operative deaths audited by SASM in 2008. Following assessment of these SASM forms the case notes of 76 of these patients were examined, where particular bleeding problems were suspected.

The patients were generally elderly and nearly all had been admitted to hospital as an emergency. The anaemia tended to be at its worst during surgery with a recovery in the post operative period. Severe anaemia occurred in some patients. This may have contributed to the deaths of these patients of whom 45% had ischemic heart disease. It was found that 26% of patients died on, or the day after surgery indicating that haemorrhage may have led directly to death.

Operative blood loss was poorly documented but where recorded the average was equivalent to an adult's circulating blood volume. This resulted in a considerable use of blood products with an average of about 9 units of red cells per patient. Coagulation tests were performed relatively infrequently but were often abnormal. There were patients where lack of coagulation tests was identified as a problem. There were a number of examples where problems and delays in the timely delivery of blood products may have compromised the care that these patients appear to have received.

Recommendations

- All hospitals should have tried and tested major haemorrhage protocols. These should be benchmarked against the forthcoming national template.
- Hospitals should review local policies and procedures to ensure blood products are readily available when required.
- Near patient testing of haemoglobin should be readily available.
- Severe anaemia should be avoided, especially in the elderly with ischemic heart disease.
- Coagulation tests should be performed more frequently when bleeding is suspected during surgery.