

Inventory Practice Survey 2007 Report

“Blood Storage - Fridges and Alarms”

1 Headline Summary Top Ten

1. Data was collected from 240 hospitals on 1100 fridges of which 777 (71%) were issue fridges
2. 504 (46%) of fridges were located in the blood transfusion laboratory, 224 (20%) in theatres and 6% in Obstetric units
3. 231 (21%) fridges had electronic tracking
4. 451/1100 (41%) of fridges held O Rh D Negative flying squad units
5. 957(87%) of fridges complied with BS4376
6. 902 (82%) of fridges and 858 (78%) of alarms were on a “maintained” power supply
7. 216 (90%) of hospitals had an SOP for alarm testing
8. For 844 (77%) fridges the low activation temperature was 2^oC and for 476 (43%) of fridges the high activation temperature was 6^oC using an air sample for both activation temperatures
9. 210 (84%) of hospitals calibrated their alarm monitoring system
10. 216 (86%) of hospitals had an SOP for the transport of units from the main storage fridge to remote fridges and 235 (98%) of hospitals used insulated containers for journeys to remote fridges of over 20 minutes

2 Background

The Blood Safety and Quality Regulations became legislation in 2005 and contain components related to the cold chain. The BSMS Inventory Practice Survey 2007 was designed to explore various aspects of blood storage related to fridges and alarms and to identify changes in practice since the last “Blood Storage” survey which was conducted in 2004 prior to the regulations.

The 2007 survey was composed of seven sections related to fridges, alarms, alarm monitoring, temperature recording system monitoring and calibration, remote fridges, and maintenance and service of fridges and alarms. The survey was sent to the 309 BSMS registered hospitals.

Year	Survey Title	Returned	Registered	Percentage
2004	Blood Storage - Fridges and Alarms	234	289	81%
2007	Blood Storage - Fridges and Alarms	240	309	78%

240 (78%) of hospitals returned the survey covering a total of 1100 fridges.

Previous survey reports are available on www.bloodstocks.co.uk/reports/inventorypracticesurveys

3 Type, number and capacity of fridges

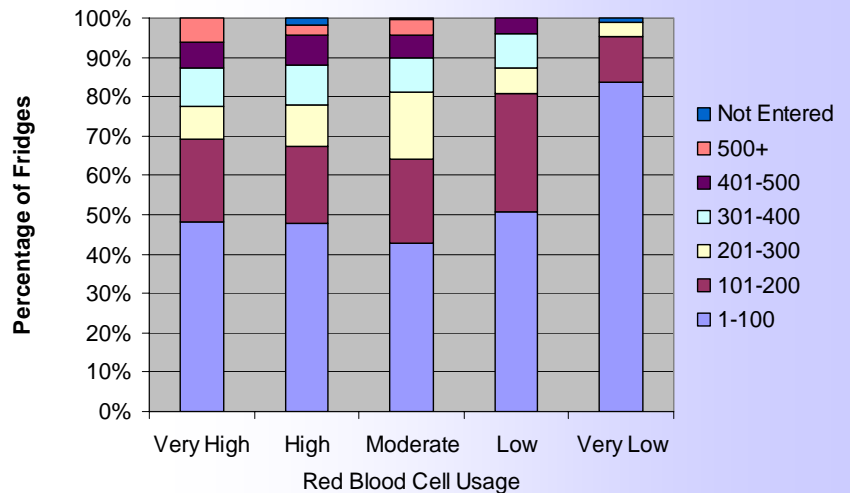
Red Cell Usage	Issue	Stock	Joint	Not Known	Hospital Count	Fridge Total
Very High	302	66	6	1	47	375
High	190	69	7	1	51	267
Moderate	159	76	6	5	64	246
Low	80	39	7	0	40	126
Very Low	46	31	9	0	38	86
Total	777	281	35	7	240	1100

Of the 1100 fridges in the survey 777 (71%) were designated issue fridges and 281/1100 (26%) stock fridges. The maximum number of fridges in any one hospital was 21.

There has been no significant change in the proportions of different types of fridges since the 2004 survey. The maximum number of fridges in any one hospital in 2004 was 22.

Nearly half the fridges were of the smallest capacity containing up to 100 red cell units. Only 40 (4%) of fridges were of the largest capacity containing more than 500 red cell units.

The size of the fridges varied according to hospital size with the majority of the largest fridges being found in "very high" usage hospitals.



4 Location of fridges

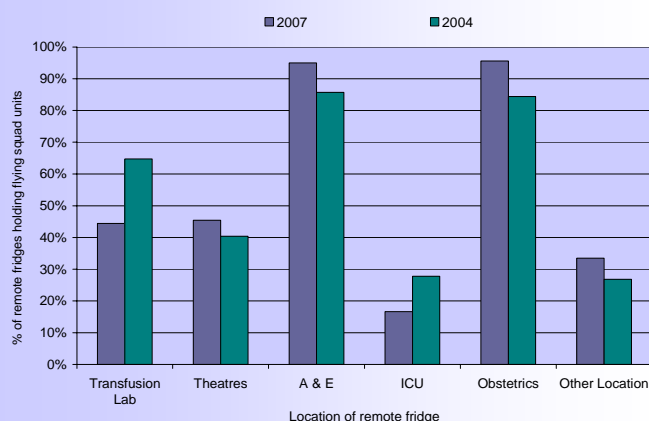
Fridge Location	Total Number of Fridges	Number of Remote Fridges
Transfusion Lab	504	90
Theatres	224	218
Obstetrics	70	68
ICU	38	36
A & E	21	20
Other Location	243	227
Total	1100	659

Nearly half (46%) of all fridges were located in the transfusion laboratory with a further 224 (20%) in theatres. 70 (6%) of fridges were in Obstetric units. There was no change in the distribution of the location of fridges from 2004.

659 (60%) of all fridges were classified as remote. For the purposes of consistency with the 2004 survey remote fridges were classified by the BSMS as any fridge that was not physically in the blood transfusion laboratory and was a journey time of more than zero minutes from the laboratory.

5 Flying Squad Units

Flying squad units were held in 46% of remote fridges, this compares with 23% in 2004.

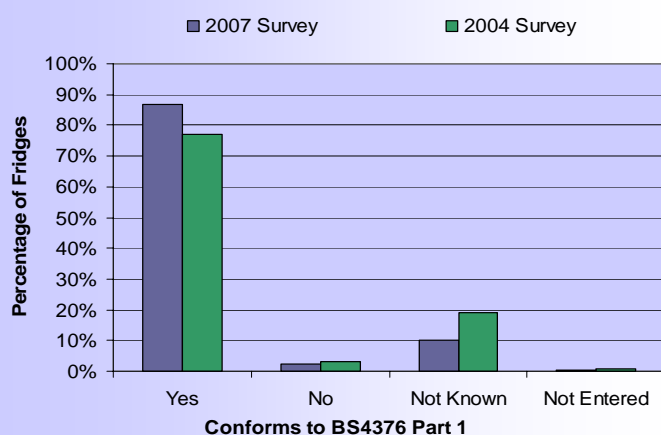


Flying Squad Units Held in Fridge	All Fridges	Remote Fridges
Yes	41%	46%
No	58%	54%
Not Entered	1%	0%

95% of all remote A & E fridges and 96% of remote Obstetric unit fridges held flying squad units. This compares with 84% of remote A & E fridges and 84% of remote Obstetric fridges in 2004. The number of ICU fridges containing flying squad units fell from 28% in 2004 to 17% in 2007.

The use of flying squad units in remote fridges should be regularly audited and their necessity reviewed in the light of the audit.

6 Compliance with BS4376



957/1100 (87%) of fridges complied with BS 4376. This is an improvement from 2004 when 878/1139 (77%) of fridges were compliant.

Compliance is linked to the age of the fridge; 98% of fridges under 2 years old were compliant and only 55% of those over 20 years old complied.

7 Electronic Tracking

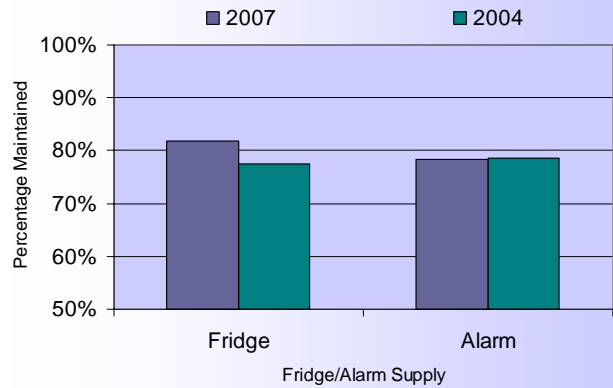
Electronic Tracking	Percentage of Fridges
Yes	21%
No	78%
Not Known	1%
Total	100%

231 fridges had associated "electronic" tracking. The presence of tracking depended on the size of the hospital. 46% of fridges in "very high" and "high usage" hospitals had associated tracking.

8 Fridge and Alarm Maintained Supply

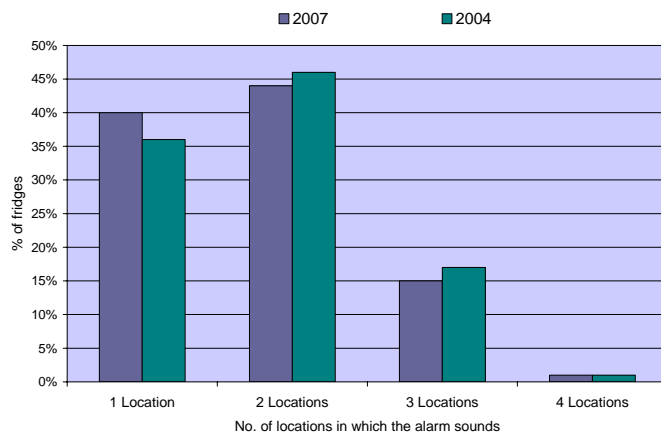
82% of fridges and 78% of alarms were on a main-maintained/protected supply. This was a slight improvement from 2004 when 77% of fridges were on a maintained power supply.

90% of fridge maintained power supplies and 89% of alarm maintained power supplies were tested. This question was not asked in 2004 so no comparisons can be made.

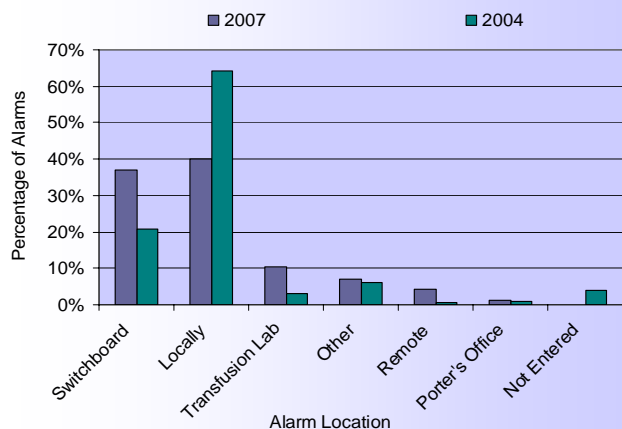


18% of fridges and 22% of fridge alarms are not on a maintained power supply. If the power supply fails for a significant time period blood in these fridges is likely to be lost to wastage.

9 Location of Fridge Alarm



There was a slight increase in the percentage of fridges in which the alarm sounded only in one location. Laboratories should ensure that this location is constantly manned or if unmanned for some of the time that there is the facility in place to alert the transfusion laboratory to an alarm incident.



For remote fridges there has been a decrease in the number of alarms that sound only locally and a corresponding increase in the number of alarms that sound at the switchboard.

For 40% of remote fridges the alarm only sounds locally. If the local area is unmanned, laboratory staff will be unaware of a fridge problem with the potential loss of red cell units.

10 Temperature Monitoring

There were no questions in the 2004 survey in relation to temperature monitoring, calibration or fridge mapping and therefore no comparisons can be made.

Low Activation Temperature	Number of Fridges	% of Fridges
0°C - Air	8	1%
2°C - Air	844	77%
2°C - Dummy Sample	130	12%
2°C - Unknown	81	7%
4°C - Air	15	1%
4°C - Dummy Sample	4	0%
4°C - Unknown	2	0%
Not Entered / Not Known	16	1%
Total	1100	100%

96% of fridges had a low activation temperature of 2°C. There was variation in the methodology of sampling, an air sample was used in the majority of fridges but in 12% of fridges a dummy sample was used.

643/1100 fridges have a high activation temperature of 6°C. There is variation in the methodology; an air sample was used in the majority of fridges but in 11% of fridges a dummy sample was used.

High Activation Temperature	Number of Fridges	% of Fridges
10°C - Air	10	1%
10°C - Dummy Sample	3	0%
8°C - Air	376	34%
8°C - Dummy Sample	11	1%
8°C - Unknown	29	3%
7°C - Air	5	0%
6°C - Air	476	43%
6°C - Dummy Sample	117	11%
6°C - Unknown	55	5%
5°C - Unknown	2	0%
Not Entered / Not Known	16	1%
Total	1100	100%

*“The current air temperature alarm set at 2°C and 8°C is an alert alarm to warn of possible problems. It is allowable for this alarm to have a time delay. A buffered load alarm is required to work on the core temperature of the blood. This alarm must have a trigger points of 2°C and 6°C. This is an action alarm and **must not** have a time delay.*

The thermal mass and position of this probe should be at a position defined by suitable temperature mapping as defined in BS 4376 e.g. equivalent temperature capacity to 200ml water.

You should be able to demonstrate that the core temperature never goes outside the 2°C - 6°C requirement with the current delay which is set on your air temperature alarm.”

Cold Chain Issues www.transfusionguidelines.org.uk

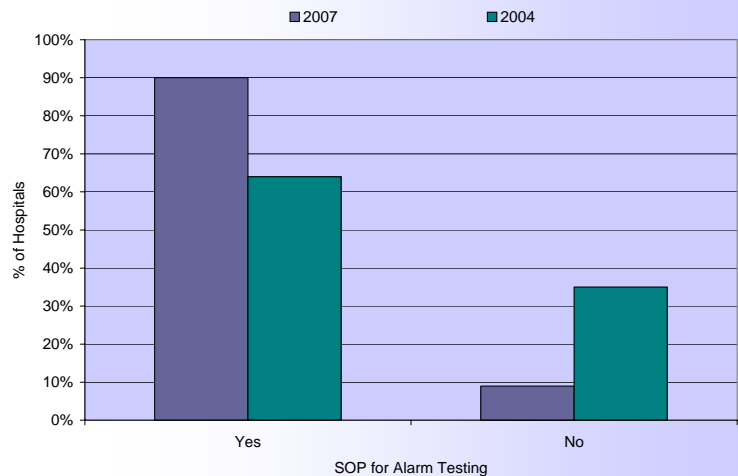
11 Alarm Testing

Testing Frequency – During Normal Working Hours	Non-Remote Fridges	Remote Fridges	All Fridges
Every 1-7 Days	86%	83%	84%
Every 8-14 Days	4%	3%	3%
Every 15 Days or More	9%	10%	10%
Never	0%	1%	1%
Unknown	0%	3%	2%
Total	100%	100%	100%

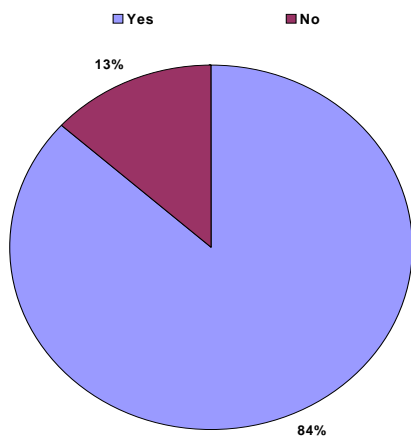
84% of fridge alarms were tested every 1 to 7 days during normal working hours, this is a slight increase compared to the 2004 survey. Out of routine hours, 18% of fridge alarms were tested every three months or less; a slight improvement on the 2004 survey.

The number of hospitals with a SOP for alarm testing has increased from 64% in 2004 to 90% in 2007.

85% of the SOPs in place covered documentation in the event of an alarm being activated.



12 Temperature Calibration

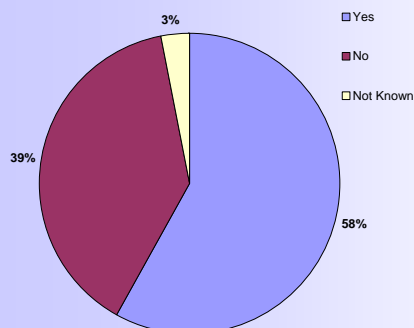


84% of hospitals calibrated their alarm monitoring system. Of those hospitals that calibrate their alarm monitoring system 71% calibrated annually and 25% every six months.

The chart recorder, digital readout, max/min thermometer, central monitoring system whichever you choose will need to be calibrated annually and you will need a certificate for the calibration equipment, traceable to National Standards

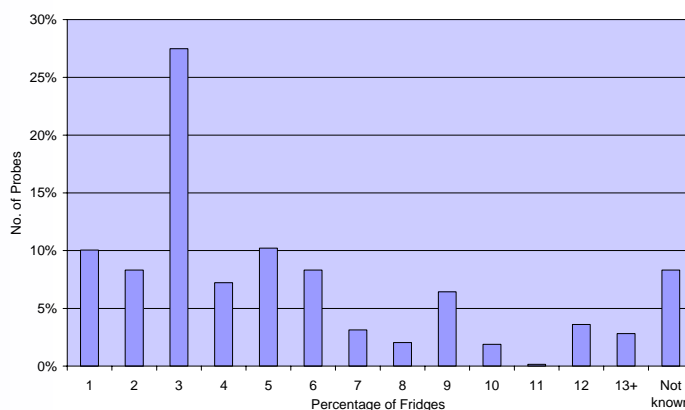
Understanding the Cold Chain requirements, www.transfusionguidelines.org.uk

13 Fridge Mapping



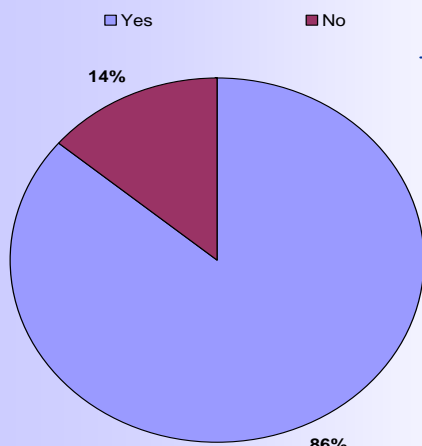
The temperature controlling equipment was mapped in 58% of fridges and not mapped in 39% of fridges.

Three probes were used in 27% of fridges and one and five probes were used in 10% of fridges.



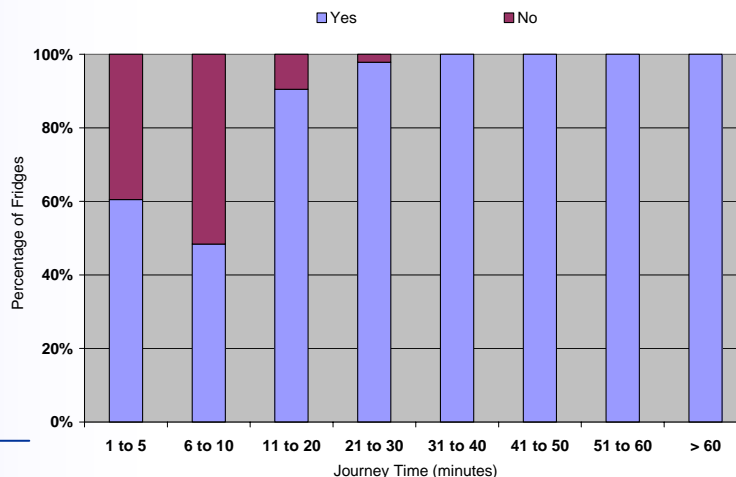
All equipment controlling temperature must be temperature mapped once a year. The test must have a duration of at least 24 hours and should for the smallest of storage equipment include a minimum of 3 points which will normally be at least the centre, top and bottom. Understanding the Cold Chain requirements, www.transfusionguidelines.org.uk

14 Transportation to Remote Fridges



86% of hospitals had an SOP for the transport of units from the main storage fridge to remote fridges

Insulated containers are used for 98% of journeys over 20 minutes and for all journeys of 30 minutes and over.



15 Further Reading

New Regulations - www.transfusionguidelines.org.uk

Guidelines for the Blood Transfusion Services in the United Kingdom (Red Book), *The Stationery Office*

J.C Faber Blood Cold Chain *ISBT Science Series 2007*; .Vol 2, 2, 1 - 6

Inventory Practice Survey 2004 report www.bloodstocks.co.uk

Blood Storage - Spotlight 2005 No.2 www.bloodstocks.co.uk

SHOT Annual Report 2007 p44-45 www.shotuk.org

16 Managers Summary

The 2004 Inventory Practice Survey identified a number of deficiencies in the management of blood storage refrigerators and it was hoped that the introduction of the Blood Quality and Safety Regulations would help hospitals to address some of the problems identified in the survey.

The 2007 survey is encouraging as it has identified that some improvements have been made namely:-

- An increase in the number of fridges compliant with BS4376
- An increase in the number of fridges on a maintained power supply
- An increase in the number of hospitals with a SOP for alarm testing
- A decrease in the number of alarms that sound locally to remote fridges

The BSQR identify the importance of ensuring red cell components are stored within the temperature range 2°C - 6°C core temperature and 2°C - 10°C air temperature. Temperature monitoring, temperature mapping and calibration of monitoring equipment are all important aspects of the regulations. The survey identified that:-

- There is variation in temperature monitoring especially related to the high activation temperature which ranged from 5°C to 10°C
- The temperature controlling equipment was mapped in only just over half of all fridges
- The majority of hospitals calibrate their alarm monitoring systems

There was a significant increase in the number of hospitals that had a SOP for alarm testing. In 2004 only 64% of hospitals had a SOP in 2007 the number of hospitals had increased to 90%. 85% of the SOPs in place covered documentation in the event of an alarm being activated. 86% of hospitals have a SOP for transport of units between the main storage fridge and remote fridges.

The 2007 SHOT report highlighted 34 cold chain errors of which seven were alarm related. 3/7 were alarm failures on a platelet agitator and the other four associated with fridge alarms. These errors with potential associated blood wastage and adverse reactions for the patient outline the importance of ensuring a high standard for cold chain validation.

Judith Chapman, BSMS Manager

A more comprehensive inventory practice survey report can be found on www.bloodstocks.co.uk/reports/

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For more information on blood inventory management, visit our website at www.bloodstocks.co.uk