National Comparative Audit
of Blood Transfusion

NHS
Blood and Transplant

2022 Audit of Blood Sample Collection & Labelling

October 2022

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SUMMARY

- 23584 rejected samples were reported by 179 sites in 1 month.
- Sample rejection rate of 4.4% represents a 50% increase compared to 2012 audit (2.99%).
- Reported number of wrong blood in tube (WBIT) incidents increased almost 3 fold compared to 2012 (92 in 1 month compared to 99 in 3 months).
- WBITs may be underreported to SHOT
- Sites with electronic sample labelling systems reported 50% fewer mislabelled samples, but no fewer (and based on few sites, potentially more) WBIT incidents.
- Electronic systems are not a substitute for positive patient identification.
- Staff at sites with electronic systems still need training in appropriate hand labelling for areas or scenarios where the electronic system is not available.
- It is often impossible to identify the individual taking a rejected sample – which represents a missed opportunity for feedback.
- 14.9% of samples were rejected for missing signatures on sample or form. Unless this represents a reliable way to identify the blood-taker, it may be questioned whether this adds to patient safety.
- Sites commonly collect data on reasons for mislabelling but not in a format readily enabling automated analysis.

RECOMMENDATIONS

- All hospital transfusion teams should ensure that induction and refresher training on sample labelling and requests is made available and is appropriate to Trust guidelines and policies. It is suggested that this training should be targeted to the areas where rejection rates are highest, as indicated by the results from this audit or from local reporting/knowledge.

- Transfusion teams should assess environmental and human factors in clinical areas with high mislabelling rates, to identify systemic factors contributing to poor practice and understand any workarounds.

- The identity of staff responsible for taking samples/completing request forms should be readily identifiable both from the request/sample itself and from any electronic or audit records held. Electronic systems and processes should be designed to collect sufficient information to be able to confirm the identity and job role of the sample taker.

- Data collected routinely about mislabelled and rejected samples should be sufficient to allow meaningful reports to be easily generated. The systems used should be capable of producing summary reports automatically. We recommend that hospitals use these data to regularly measure their mislabelling/WBIT rates in order to benchmark their progress.

- The number of WBITs reported during the audit period is at odds with the annual number reported in recent SHOT reports. Transfusion teams should report all cases of WBIT to SHOT to support safety initiatives nationally.

- While electronic requesting and labelling cannot eliminate all problems, the improvement in sample labelling quality is clearly demonstrable. This is recommended as the gold standard that should be aimed for. However, transfusion teams need to continually review how these systems are being used in practice to ensure workarounds and corner-cutting measures are not being taken. Paper request forms and hand labelling should still form part of mandatory training to cover system downtime, particularly where electronic systems are the only method in regular use and staff do not normally complete manual/paper requests.

- Positive patient identification remains fundamental at all stages in the transfusion process and its importance must continue to be emphasised, particularly when electronic bedside identification systems are implemented. Patients themselves should be encouraged to check the labelling of their samples, where appropriate.

- We recommend that sites review their local policies on sample rejection, particularly in relation to discrepancies in fields such as signatures on both sample and form (eg. in fields other than the core identifiers), to ensure that they benefit patient safety.

- Following this report, the NCABT team are hoping to use the information collected to facilitate a targeted improvement process. Sites with the greatest potential for improvement will be contacted, and the NCABT team will volunteer to support a more dynamic audit methodology and hopefully promote change and improvement.

INTRODUCTION

Why Was This Audit Necessary?

This was a repeat of a national comparative audit performed in 2012. The 2012 audit found that 2.99% of blood samples for transfusion were rejected as a result of labelling errors and there were 99 'Wrong blood in tube' (WBIT) samples reported over a 3-month period.[1]

In the last 10 years there have been a number of safety recommendations and initiatives around sample labelling, most notably the drive for increased uptake of electronic bedside identification systems, where a sample label is printed at the bedside after scanning the patient's wristband.[2] These have been recommended in national guidelines.[3,4] However, these systems are costly and logistically challenging to implement. Over the same period, healthcare teams have faced mounting workloads and pressures, potentially leading to increased rates of errors and adoption of workarounds perceived to save time. Changes in working practices since the COVID-19 pandemic may have impacted staff training. This seemed an appropriate time to repeat the audit to reassess the extent of sample mislabelling, and to evaluate whether electronic systems are associated with a reduction in sample rejection.

British Society for Haematology (BSH) guidelines require that all blood samples and requests for transfusion carry four points of identification: first and last names, date of birth and unique identifying number. They must also include the date and time of sampling and the identification of the staff member taking the sample.[5]

Errors can occur because a blood sample is mis-collected (from the wrong patient) or mislabelled (with one of the four core identifiers missing, incorrectly written or illegible).

Factors suggested to contribute to incorrect sample taking or labelling include[6,7]:

- Lack of knowledge / understanding of the process
- Failure to properly identify the patient
- Being distracted while taking and labelling the sample
- Labelling the sample away from the vicinity of the patient
- Environmental factors
- Inadequate process (for the environment)
- Inadequate teaching
- Workarounds

Samples may be rejected for reasons other than errors in core identifiers, including discrepancies in other details on the form and sample haemolysis. In the absence of firm national guidelines, individual laboratories adopt their own policies for these scenarios, and this audit seeks to gain insight into this variation.

What Did This Audit Aim to Achieve?

The aims of this audit were:

- To collect information on the quality of practice of labelling transfusion samples
- To determine whether bedside electronic identification systems had an impact on mislabelling
- To assess the incidence of Wrong Blood in Tube (WBIT)
- To explore reasons for sample rejection
- To provide information for a project of targeted review and improvement at selected sites

Who Are the Principal Stakeholders?

- NHS hospitals
- Independent hospitals
- NHS Blood and Transplant (NHSBT)
- National Blood Transfusion Committee (NBTC)
- SHOT

Data Transparency and Data Sharing

In line with current practice within national clinical audits, the National Comparative Audit of Blood Transfusion (NCABT) is exploring ways of making key results available to organisations such as the Care Quality Commission (CQC).

At present we supply to the CQC the names of those hospitals and NHS Trusts who contribute data to our audits.

METHODS

How Were NHS Trusts and Independent Hospitals Recruited?

All NHS Trusts and independent hospitals in England were invited to participate in the audit. Trusts and hospitals in Wales, Northern Ireland and Scotland were also invited to participate, as were independent laboratories.

Data were submitted by Trusts as a whole and by individual hospitals. Therefore, the term "sites" is used throughout this report to refer to either Trust or hospital.

A letter explaining the purpose of the audit, the proposed timescale and the proposed dataset to be collected was sent via email to Chairs of HTCs, Trust Transfusion Laboratory Managers, Transfusion Practitioners and Consultant Haematologists with responsibility for blood transfusion. For independent hospitals a letter was sent to the hospital manager.

Sampling Strategy

Sites were asked to provide data on all blood samples sent for group and save or group and crossmatch which were rejected for labelling errors in the month of October 2022. They were also asked to provide the total number of samples that were sent for group and save or group and crossmatch in order to calculate local and national rates of mislabelling.

We additionally asked for details of the number of incidents formally investigated in the hospital during the audit period because they were "wrong blood in tube" events.

Where did the Standards Come From?

- Recommendations from previous audits[1]
- BSH guidelines on blood administration[5]

Data Collection Method

There were 2 types of data collection:

- Organisational proforma sent to all participating sites
- Laboratory proforma for identifying rejected samples

Organisational audit data were collected using a Microsoft Word form, while data on the rejected samples were collated by staff in transfusion laboratories using one of three methods:

- Data were entered onto pre-printed proformas which were returned to NHSBT for processing.
- Data were entered directly into the NHSBT online audit system.
- Sites which already collate these data locally could choose to submit an extract from their existing data set.

Pilot

The pilot was conducted by members of the Project Group at the following hospitals: Northumbria Specialist Emergency Care Hospital, Cumberland Infirmary Carlisle. The Organisational audit tool was trialled on paper at the same time.

Analysis and Presentation of Results

Data from the organisational questionnaire and clinical audit were analysed using Microsoft Excel.

National results are presented in this report as percentages.

Where relevant and comparable, data from the 2012 cycle of audit have been included for comparison.

AUDIT STANDARDS

The previous cycle of this Clinical Audit included further standards relating to sites having policies/SOPs in place stating the requirements for labelling blood samples taken for transfusion and the completion of request forms and what these policies should cover. During the previous cycle, only one site identified that they did not have such a policy in place and it was not felt necessary to re-audit these standards.

There was also a standard relating to the appropriate competency training and assessment of the staff member taking the sample. This was also left out as it is not always possible to identify the staff member taking the sample and it cannot be assessed how many samples were not rejected where the sample taker did not have this training.

The following standards are still applicable for this audit cycle:

STANDARD 1
Samples taken for transfusion bear all core patient identifiers (first name, last name, date of birth and unique identification number).

STANDARD 2
The transfusion request form is completed with all core patient identifiers (first name, last name, date of birth and unique identification number).

STANDARD 3
All core information on sample tubes and request forms is legible.

STANDARD 4
All core information on sample tubes and request forms matches.

STANDARD 5
The person collecting the blood sample can be readily identified from the sample tube or request form.

RESULTS:

128/140 (91%) eligible NHS trusts in England signed up for this audit. A further 4 Trusts from Scotland, 6 Boards from Wales and 3 Trusts from Northern Ireland participated from within the public sector and 12 from the independent sector also signed up. A total of 191 sites were recruited.

Sites submitted data either as individual hospitals or trusts; therefore the number of sites exceeds the number of eligible trusts. The number of eligible sites could not be estimated because whether data is submitted as a hospital or a trust varies from audit to audit.

RESULTS: ORGANISATIONAL AUDIT

Organisational questionnaire data were included for 181 sites. Note that whilst many sites submitted their own data, for some sites the submission was received from the NHS Trust and applied to each relevant site within the Trust. A similar application was made for private sector providers where applicable.

Putting information on blood sample tubes

Q1. What sample request methods do you have? (Tick as many as apply):

National	N=181	%
Electronic	89	49.17%
Paper (routine)	151	83.43%
Paper (downtime)	134	74.03%

91/181 sites (50.28%) only had paper requesting available. 60 sites (33.15%) reported that they had electronic requesting but also routinely used paper requesting. 29 sites (16.02%) had electronic requesting and did not routinely use paper requesting (although some did indicate paper requesting was in place for downtime. It is assumed that all such sites would have some form of paper requesting in place for emergencies.) 1 site did not respond to this question.

Q2. Which of the following labelling options reflects your usual practice? (Tick as many as apply):

National	N=181	%
a) Sample tube labels are handwritten at the patient's side	175	96.69%
b) Sample labels are printed at the patient's side and labels applied to the sample tube	41	22.65%
c) Pre-printed labels are used	3	1.66%

2012	***N=221***	***%***
Sample tube labels are handwritten at the patient's side	*218*	*99%*
Sample tube labels are printed at the patient's side and are stuck onto the tube	*15*	*7%*
Other	*8*	*4%*

137 sites (75.69%) only use handwritten labels. 6 sites (75.69%) only use labels printed at the patient's side. 34 sites (18.78%) use a combination of handwritten labels and labels printed at the patient's side. 2 sites (1.10%) use handwritten labels and pre-printed labels, 1 site uses handwritten labels, labels printed at the patient's side and pre-printed labels and 1 site did not respond to this question.

There has been a large increase (224%) in the number of sites with the capacity to print sample labels at the patient's side since the 2012 audit cycle. However, the majority of sites still use entirely handwritten sample labels.

Regional uptake of electronic sample labelling

Region	Uptake
East of England	4/18 (22.22%)
London	9/28 (32.14%)
Midlands	2/24 (8.33%)
North East and Yorkshire	2/21 (9.52%)
North West	3/22 (13.64%)
South East	9/23 (39.13%)
South West	10/16 (62.5%)
TOTAL NHS ENGLAND	**39/152 (25.66%)**
Northern Ireland	0/4 (0%)
Scotland	0/4 (0%)
Wales	0/12 (0%)
PRIVATE	2/12 (16.67%)
GRAND TOTAL	**41/184 (22.28%)**

Putting information on blood request forms

Q3 . Which of the following labelling options reflects your usual practice? (Tick as many as apply):

National	N=181	%
a) Request forms are handwritten	131	72.38%
b) Labels that are printed at the patient's side are attached to the request form	17	9.39%
c) Pre-printed labels are attached to the request form	100	55.25%
d) A request form is printed and sent with the sample tube	76	41.99%
e) No request form is used – electronic ordering is in operation	20	11.05%

24/181 (13%) sites only use handwritten request forms as usual practice.

91/181 (50%) sites have the ability to use some form of electronic form generation as usual practice.

66/181 (36%) sites produce printed labels to be attached to a form.

Mis-labelled samples

Q4. Regarding mislabelled samples, which of these options best describes your practice:

National (N=181)	**Group & cross match**	**Group & screen**	**Ante-natal**
a) We operate "Zero Tolerance", which means that no amendments or additions are allowed and all mislabelled samples are rejected and none are processed.	172 (95.03%)	174 (96.13%)	154 (85.08%)
b) Laboratory allows addition or correction of information and then processes the sample.	3 (1.66%)	2 (1.10%)	2 (1.10%)
c) Laboratory only holds "precious samples", such as those from neonates and allows addition or correction of information and then processes sample.	12 (6.63%)	11 (6.08%)	4 (2.21%)
d) Other, please state:	22 (12.15%)	21 (11.60%)	13 (7.18%)

*See appendix for details of **Other please state**.*

NB: Some sites responded to more than one option, indicating that they operate a "Zero Tolerance" policy but still allow amendments under certain circumstances. 41 sites (22.65%) indicated that changes were allowed for one or more sample type and this has been used as the denominator for Q5 and Q6 below.

Q5. If your practice allows for the addition or amendment of information, what is allowed? (N=41)

Amendments allowed to the following on tube and/or form:	**National N=41**
Core patient identifiers	8 (19.5%)
date and time	7/41 (17.1%)
signature	7/41 (17.1%)
Other details	8/41 (19.5%)

27/41 (65.9%) sites did not indicate exactly what amendments were allowed, but of these sites 13/27 (48.1%) indicated by free text response that the changes they allowed were for minor mislabelling to precious samples.

Q6. If you allow additions or amendments, who is allowed to make them? (Tick as many as apply):

19/41 (46.3%) sites indicated that the person who collected the blood sample was the person who was allowed to make amendments. The remaining 22/41 (53.7%) sites indicated amendments were allowed but did not complete this question.

Haemolysed samples

Q7. Does your laboratory have an SOP that covers the rejection of samples?

National	N=181	%
Yes	179	98.9%

Q7a. If yes, does this SOP cover the rejection of haemolysed samples?:

National	N=179	%
Yes	159	88.83%

Q8. What criteria do you use to classify a sample as haemolysed ?

National	N=181	%
Visual by experience	133	73.48%
Visual by guide	27	14.92%
Determined by analyser	142	78.45%
Other (please specify)	5	2.76%

*See appendix for details of **Other please specify.***

Q8a. Who makes this decision?:

National	N=181	%
Analyser	129	71.27%
Transfusion support staff	46	25.41%
BMS 5	129	71.27%
BMS 6	150	82.87%
BMS 7	139	76.80%
Other (please state)	8	4.42%

*See appendix for details of **Other please state.***

Local reporting

Q9. Do you have systems or processes in place to collect and report the following?:

National	N=181	%
a) How many samples are rejected over a given time period	176	97.24%
b) Where the rejected sample was received from	172	95.03%
c) What the reason for rejection is	171	94.48%

Q10. If you answered YES to Q9c, do you record the following reasons? (Tick as many as apply):

National	N=170	%
Core patient identifier(s) don't match on tube and form	160	93.57%
Core patient identifier(s) missing from tube	164	95.91%
Other required details missing from form	142	83.04%
Core patient identifier(s) missing from form	152	88.89%
Pre-printed label on tube	159	92.98%
Other required details missing from tube	151	88.30%
Current identifiers do not match historical identifiers	134	78.36%
Unlabelled tube or form	162	94.74%
Other required details don't match on tube and form	142	83.53%
Illegible details on tube or form	153	89.47%
Details overwritten	138	80.70%
Grossly Haemolysed sample	160	93.57%

Q11. If you answered YES to any part of question 10, how can the information collected be accessed? (Tick as many as apply):

National	N=165	%
a) local summary reports / graphs (not individual sample data)	69	41.57%
b) electronic data export (e.g. Microsoft Excel or CSV file)	125	75.30%
c) Other, please state:	32	19.28%

*See appendix for details of **Other please state.***

It is notable from data submitted for this audit that the information being routinely collected is often not easily analysable. For example, many sites collect this information as free text responses in existing systems which cannot be automatically collated. Not all sites recorded all information required for the audit (for example, data from some sites did not differentiate between errors on the sample tube and errors on the request form).

Audit participation

Q 12. What is your preferred method for data collection?

National	N=181	%
Electronic submission	111	61.33%
Online data collection form	84	46.41%
Paper	24	13.26%

RESULTS: TOTAL LABORATORY SAMPLES, WBIT NUMBERS AND SAMPLE REJECTION RATES

Participants were asked for the total number of samples received during the month of October 2022. They were also asked for the number of WBIT incidents and were asked to provide the total number of samples that were, for any reason, rejected in the laboratory because of labelling errors.

	National (175 sites)
Total samples	528935
WBITs	92
Total rejected samples	23074 (4.4%)

Sample rejection rate:

Overall, 179 participants reported a total of 23584 rejected samples over the month of October.

Only for 175 sites were both the total number of samples and the total number of rejected samples known. For these 175 sites the overall rejection rate was 23074 rejected from 528935, or 4.4% (2012 audit – 25279/845445 = 2.99%).

Wrong Blood in Tube

There were 92 instances of WBIT. This compares to 99 in the 2012 audit over a three month period.

Out of 176 respondents, 119 reported no WBITs, 38 reported one, 12 sites reported two, 3 reported three, 3 reported five and 1 reported six.

RESULTS: SAMPLES REJECTED BY THE TRANSFUSION LABORATORY

A note on UNKNOWN data
Some sites do not collect all the required data or use coding which does not easily match the manual audit. Where this is the case throughout the following section, these data have been included as mislabelled samples but recorded as "Unknown".

Another significant factor in Unknown data is legibility. For example often a signature is present, but is not significantly legible to allow staff to determine the name – and from this the job role – of a staff member.

Sites were asked to record details of every blood sample rejected due to a labelling error on the tube or request form. Where sites already collected these data (either due to existing electronic systems or ongoing local audit) they were offered the opportunity to submit these data and this was re-coded by the NCA team to match the manual audit.

This section is based on 21511 lab proforma entries from 179 respondents.

Who is making the errors?

	2022 National		***2012 National***	
	N= 21511	**%**	***N= 38112***	***%***
Unknown	10368	48.2	*14612*	*38.3*
Nurse	3784	17.6	*5621*	*14.7*
Doctor	2976	13.8	*8410*	*22.1*
Midwife	2505	11.6	*6685*	*17.5*
Health Care Assistant	928	4.3	*778*	*2.0*
Phlebotomist	751	3.5	*1883*	*4.9*
Nursing associate	54	0.3		*0.0*
Physician associate	54	0.3		*0.0*
Student midwife	45	0.2		*0.0*
Medical student	25	0.1		*0.0*
ODA/ODP	14	0.1	*123*	*0.3*
Anaesthetic associate	7	0.0		*0.0*

Where are the errors being made?

	2022 National		***2012 National***	
	N= 21511	**%**	***N= 38323***	***%***
Unknown	5707	26.5	*1029*	*2.7*
Inpatient ward	4229	19.7	*10801*	*28.2*
A&E / Emergency Department	3839	17.8	*7198*	*18.8*
Outpatient clinic / Pre-op clinic	2634	12.2	*5431*	*14.2*
Delivery suite	1194	5.6	*3453*	*9.0*
Community	1027	4.8	*4893*	*12.8*
Day ward	805	3.7	*1496*	*3.9*
Intensive Care Unit / HDU	485	2.3	*1163*	*3.0*
Paediatric ward or similar	390	1.8	*670*	*1.7*
Surgical Assessment Unit (or similar)	340	1.6		
Medical Assessment Unit (or similar)	336	1.6	*1559*	*4.1*
Theatres / Recovery	236	1.1	*316*	*0.8*
Neonatal Unit	153	0.7	*314*	*0.8*
Phlebotomy department	136	0.6		

When were the samples taken?

9403/21511 samples (43.7%) were taken in core hours and 5242/21511 (24.4%) were taken out of hours. Not known for 6866/21511 (31.9%) samples.

What data were missing from the sample tube?

	2022 National		***2012 National***	
	N= 18674	**%**	***N= 39294***	***%***
Core patient identifier(s) don't match on tube & form	6316	33.8	*15946*	*40.6*
Core patient identifier(s) missing from tube	3048	16.3	*8678*	*22.1*
Form not signed	1475	7.9		*0.0*
Tube not signed	1312	7.0		*0.0*
Other required details missing from tube	1139	6.1	*2330*	*5.9*
Pre-printed label on tube	1093	5.9	*2440*	*6.2*
Core patient identifier(s) missing from form	937	5.0	*2492*	*6.3*
Details overwritten	881	4.7	*583*	*1.5*
Other required details missing from form	606	3.2	*2556*	*6.5*
Unlabelled tube or form	564	3.0	*1171*	*3.0*
Current identifiers don’t match historical identifiers	540	2.9	*1423*	*3.6*
Illegible details on tube or form	419	2.2	*761*	*1.9*
Other required details don't match on tube & form	344	1.8	*914*	*2.3*

Note that some samples were rejected for multiple reasons and the specific reason for rejection of some samples is unknown. 3347/21511 (16%) samples were rejected for an uncoded reason.

RESULTS: SITES WITH AND WITHOUT ELECTRONIC SYSTEMS

Based on the responses from the organisational questionnaire, we were able to identify sites where the sampling system was wholly electronic or wholly hand-written for either sample labelling or request forms as part of usual practice. The groups were identified as follows using the responses to the organisational questionnaire:

Electronic Sites

- Sample (6 sites): responded yes to question 2b (Sample labels are printed at the patient's side and labels applied to the sample tube) and did not select any other option under question 2
- Request Form (34 sites): responded yes to question 3d (A request form is printed and sent with the sample tube) or 3e (No request form is used – electronic ordering is in operation) and did not select any other option under question 3
- Sample AND Request form (4 sites): all sites which fall into both of the above categories

Hand-written Sites

- Sample (137 sites): responded yes to question 2a (Sample tube labels are handwritten at the patient's side) and did not select any other option under question 2
- Request form (24 sites): responded yes to question 3a (Request forms are handwritten) and did not select any other option under question 3
- Sample AND Request form (21 sites): all sites which fall into both of the above categories

	Electronic Sample AND Request form		**Handwritten Sample AND Request form**	
	COUNT	**%**	**COUNT**	**%**
No of sites	4	NA	21	NA
Samples in month	17601	NA	37071	NA
WBITs in month	11	1 in 1600	4	1 in 9268
Mislabelled samples	409	2.3%	2171	5.9%

The reasons for mislabelling related specifically to request form or sample were then linked to whether the site had electronic methods only for the request form or sample.

Unlike other figures in this report, these are presented as a percentage of the **total samples for the month**. Although these percentages are extremely small it is hoped this provides comparable figures. The number and percentage of WBITs reported is also included.

Sample labelling errors	Electronic (6 sites)		Handwritten (137 sites)	
	National n= 28719	%	National n= 345352	%
Core patient identifier(s) missing from tube	43	0.15%	2440	0.71%
Other required details missing from tube	183	0.64%	666	0.19%
Tube not signed	79	0.28%	886	0.26%
Pre-printed label on tube	112	0.39%	666	0.19%
WBITs	14	0.05%	55	0.02%

Request form errors	Electronic (34 sites)		Handwritten (24 sites)	
	National n= 111495	%	National n= 54185	%
Core patient identifier(s) missing from form	31	0.03%	159	0.29%
Other required details missing from form	33	0.03%	138	0.25%
Form not signed	260	0.23%	140	0.26%
WBITs	27	0.02%	7	0.01%

These data potentially suggest that electronic sites are still getting handwritten samples/ forms in some circumstances, or that there were errors in the printing of the label/ form (e.g. misalignment).

As the aim is to examine the impact of electronic systems at hospital level we did not audit whether individual rejected samples/ forms were labelled electronically or handwritten. We are therefore unable to drill down further into these data and sites should examine their own data/systems as appropriate.

It was notable that the site reporting 6 WBITs in the timeframe was fully electronic for both sampling and request forms.

RESULTS: AUDIT STANDARDS

Statement	Compliance
Samples taken for transfusion bear all core patient identifiers (first name, last name, date of birth and unique identification number)	99.42% (525887/528935)
The transfusion request form is completed with all core patient identifiers (first name, last name, date of birth and unique identification number)	99.82% (527998/528935)
All core information on sample tubes and request forms is legible.	99.92% (528516/528935)
All core information on sample tubes and request forms matches.	98.81% (522619/528935)
The person collecting the blood sample can be readily identified from the sample tube or request form.	See discussion

These numbers are small but not insignificant. The number in each individual category is small but overall mislabelling is a substantial problem.

Percentage compliance is high, however each of the 23,537 samples represents a patient potentially suffering harm by having to be re-bled.

DISCUSSION

This clinical audit had two sections. First, an organisational audit examined policy on the collection and labelling of blood samples for transfusion. Second, the rate of sample rejection (mislabelling) and incidence of WBIT were collected within large populations. Job title, clinical area and nature of labelling error were collected for 21464 samples.

A third section is planned, where the NCABT team are hoping to use the information collected in the first two sections to facilitate a targeted improvement process. Sites with the greatest potential for improvement will be contacted, and the NCABT team will volunteer to support a more dynamic audit methodology and hopefully promote change and improvement.

ORGANISATIONAL SURVEY

Organisational questionnaire data were available for 181 sites.

The number of sites employing bedside systems for printing electronic sample labels has increased nearly threefold since 2012 (41 compared to 15), however most of these sites also use hand labelling for at least some routine samples. There is marked geographic disparity in uptake, with use concentrated in the South of England, and no NHS hospitals in Scotland, Wales or Northern Ireland reporting their implementation. Half of sites use an electronically-generated request form for at least some of their routine practice.

While >95% of sites claimed a ‘zero tolerance’ policy on mislabelling of samples for group and screen/ group and crossmatch, 41 (22.65%) sites allow changes to the tube or form in at least some circumstances, e.g. for precious samples, including (at 8 sites) to core identifiers. A further 15 (8.29%) sites either selected a change which was allowed or made free text responses which indicated that they allowed changes despite claiming an absolute zero tolerance policy.

Of those sites which allowed changes on the tube or form, changes were only allowed by the person who collected the sample (on the previous cycle some sites had policies allowing changes but allowed other staff members to make changes, which was felt to be inappropriate).

There is considerable variation in practice around assessing and processing haemolysed samples. Acceptance may be determined by the analyser, or the decision made by visual inspection, with or without a guide. This suggests a need for published guidance to help standardise practice and avoid unnecessary sample rejection.

Although the vast majority (>94%) of sites collect some data about rates of and reasons for sample rejection, the precise details recorded are variable, and often information is not collected in a form that facilitates automated analysis. This may mean laborious manual audit is required to produce summary data, and teams are missing the opportunity to use this information to feed back to clinical teams and influence practice.

AUDIT

Mislabelling rates and number of WBIT samples

A total of 92 WBITs were reported during the 1 month study period. This compares to 99 reported over a 3 month period in the 2012 audit. The 2-sample rule introduced in 2012, requiring a patient's blood group to be tested on 2 separate occasions prior to issue of group-specific red cells, may have improved WBIT detection. This practice change may also in part account for the higher total number of transfusion samples processed: 528,935 in 2022 compared to an average of 281,815 per month in 2012. Accounting for this increased activity, this still represents a WBIT incidence of 1 in 5882 in 2022 compared to 1 in 8547 in 2012. Arguably, the absolute number of WBITs is more important, as each of these represents a potential ABO-incompatible transfusion. This sends a worrying safety signal about failure to follow basic positive patient identification checks. In 2021, 734 WBIT incidents were reported to SHOT. Data from this audit would suggest there may be significant under-reporting. Transfusion is unique amongst pathology disciplines for routinely collecting WBIT data. The incidence of WBIT errors for haematology or biochemistry samples, possibly resulting in inappropriate clinical decision making and treatment, is unknown but likely to be greater.

The total number of rejected samples was 23584 from 179 sites. The rejection rate can only be calculated using data from the 175 sites that also supplied total transfusion sample figures for the period, giving a figure of 23074/528935, 4.36%. This represents a 50% increase on the rejection rate in the 2012 audit. (2012 audit 25279/845445, 2.99%). While the percentage figure might seem modest, this means 23584 patients in just one month potentially faced delays to treatment or needed to be rebled.

The effect of electronic tube labelling and request forms

Sample rejection rates for sites that operated fully electronic systems were lower than those that used completely handwritten systems (2.3% vs. 5.9%). The fact that fully electronic sites still have samples rejected due to labelling errors highlights the need to keep devices well-maintained (to avoid misaligned labels) and also that hand-labelling will always be required in some circumstances – e.g. an emergency where electronic devices are unavailable, or during equipment downtime. It is therefore important that mandatory training continues to include correct hand-labelling practices. Sites with electronic bedside labelling reported higher rates of sample rejection due to the use of addressograph labels, suggesting the potential for confusion in operating these systems, and the need for a robust training programme.

A major selling point of bedside electronic systems is in reducing patient identification errors. However, this audit found that sites using electronic systems to label samples/ generate forms continued to report WBIT. Data from a small number of completely electronic sites suggested a higher rate of WBIT samples (more than double) relative to paper-based sites. No conclusions can be drawn from such a small subset of sites, but this observation warrants further detailed investigation. When introduced, electronic systems need to be set up and configured to make full use of all of the in-built safety features. Users can become over-reliant on electronic systems, neglecting basic practice in positive patient identification. Workarounds and corner-cutting designed to save time can also erode the safety benefits, and transfusion teams need to continually review how these systems are being used in practice. There is a need for specific resources to support identifying and addressing human factors in operating these systems.

Rejected Samples

The commonest reason for rejection were:

- Core patient identifier(s) not matching on tube & form (6316 samples, 34% of rejected samples)
- Core patient identifier(s) missing from tube (3048 samples, 16%)
- Form not signed (1475 samples, 8%)
- Tube not signed (1312 samples, 7%)

The BSH guidelines state that as a minimum the patient core identifiers (first name, last name, date of birth and unique identification number), date and time sample taken and the ID of the member of staff taking the sample are essential for specimen acceptance.[5] Signature is often taken as a surrogate for the last of these, but few laboratories, particularly in larger hospitals, can identify staff members from their signature. Although we did not specifically ask whether the sample-taker could be identified, our audit shows that in 10368 rejected samples (48%), the staff role of the person taking the sample was “unknown”. It is likely that the individual taking the sample could not be identified in at least a proportion of these. The value of a signature is therefore unproven, and it may be questioned whether patient safety was enhanced in those 2787 cases where unsigned samples were rejected. Sites may wish to include a requirement for signature in their local policy, as it is considered an indication of responsibility, but they should be clear on their rationale for doing so. They might also consider whether it would be more useful to make it a mandatory requirement for the sampler to print their name, job title and contact details on the request form, where such details may be more easily (and legibly) written.

We cannot estimate labelling error rates for each staff group because we lack denominator data nationally for the percentage of blood samples taken by each staff group, and at the local level these proportions can vary considerably between sites. Any staff can make errors in sample labelling, so training and safety interventions need to be provided for, and appropriate to, all those involved in taking transfusion samples.

The clinical areas where errors occurred most frequently were inpatient wards (26%), emergency departments (24%), outpatients/pre-op (16%), delivery suite (7%) and community (6%). Only 1% of errors occurred in operating theatres, neonatal units or phlebotomy departments. This may largely reflect the frequency of samples taken in these areas rather than the frequency of errors. However, this may highlight those areas where improvement efforts are best concentrated.

IMPROVING PRACTICE

The introduction of training and competency assessment for all staff involved in the transfusion process has had major resource implications for all hospital transfusion departments. In the previous cycle of this audit, many respondents cited unfamiliarity with procedures as a reason for error. Application of national recommendations for sample labelling and acceptance across hospital laboratories should improve consistency of practice and patient safety. These standards should also be applied to blood service reference laboratories.

Training or education alone are not sufficient to improve practice. Environmental factors such as siting of equipment or printers must also be considered. Policies and protocols should reflect the process as practicable in the environment or workarounds will ensue. Different environments may require different processes to prevent errors, e.g. inpatient wards or high pressured, unpredictable areas such as an ED are very different to an outpatient setting or an appointment-based phlebotomy area.[7]

Electronic systems for sample labelling and request form generation would seem an ideal solution to mislabelling errors, but this audit highlights that these do not prevent WBIT, and staff must still be trained in correct labelling practice for those scenarios where electronic devices cannot be used.

Correct identification of the patient is at the heart of accurate sample labelling. Patients should be educated to expect their identity to be checked, and to be encouraged to check their own samples before they leave their side.[8] This is particularly important in outpatient settings where ID bands may not be routinely worn.

Transfusion teams should design data collection systems or templates which enable automated analysis of reasons for sample rejection, and the clinical areas responsible. This can provide data to feed back to clinical teams, and to target educational efforts or further exploration of systems-based factors. Similarly, being able to accurately identify the blood-taker, for example by the request form, may help to enable individual or departmental feedback.

REFERENCES

1 National Comparative Audit of Blood Transfusion: 2012 audit of blood sample collection and labelling

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3 National Institute for Health and Care Excellence (NICE) Guidance: Blood Transfusion (2015) https://www.nice.org.uk/guidance/ng24https://www.nice.org.uk/guidance/ng24

4 Health Technology Wales (2022). Guidance on electronic blood management systems. https://healthtechnology.wales/reports-guidance/electronic-blood-management-systems/https://healthtechnology.wales/reports-guidance/electronic-blood-management-systems/

5 British Committee for Standards in Haematology (2009) Guideline on the administration of blood components https://onlinelibrary.wiley.com/doi/full/10.1111/tme.12481

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7 Healtcare Safety Investigation Branch (HSIB) (2019) Healthcare safety investigation 12019/003 Wrong patient details on blood sample https://chfg.org/hsib-report-wrong-blood-sample/https://chfg.org/hsib-report-wrong-blood-sample/

8 Stout L, Joseph S (2016). Blood transfusion: patient identification and empowerment. British Journal of Nursing, 25(3):138-43. doi: 10.12968/bjon.2016.25.3.138.

APPENDIX ONE – ORGANISATIONAL AUDIT TOOL

2022 National Comparative Audit of Blood Sample Collection and Labelling

Organisational Audit Tool

1. What sample request methods do you have? (Tick as many as apply):

Electronic	☐ Yes	☐ No
Paper (routine)	☐ Yes	☐ No
Paper (downtime)	☐ Yes	☐ No

Putting information on blood sample tubes

2. Which of the following labelling options reflects your usual practice? (Tick as many as apply):

a) Sample tube labels are handwritten at the patient's side	☐
b) Sample labels are printed at the patient's side and labels applied to the sample tube	☐
c) Pre-printed labels are used	☐

Putting information on blood request forms

3. Which of the following labelling options reflects your usual practice? (Tick as many as apply):

a) Request forms are handwritten	☐
b) Labels that are printed at the patient's side are attached to the request form	☐
c) Pre-printed labels are attached to the request form	☐
d) A request form is printed and sent with the sample tube	☐
e) No request form is used – electronic ordering is in operation	☐

Mis-labelled samples

4. Regarding mislabelled samples, which of these options best describes your practice:	**Group & cross match**	**Group & screen**	**Ante-natal**
a) We operate "Zero Tolerance", which means that no amendments or additions are allowed and all mislabelled samples are rejected and none are processed.	☐	☐	☐
b) Laboratory allows addition or correction of information and then processes the sample.	☐	☐	☐
c) Laboratory only holds "precious samples", such as those from neonates and allows addition or correction of information and then processes sample.	☐	☐	☐
d) Other, please state:	☐	☐	☐

Click or tap here to enter text.

5. If your practice allows for the addition or amendment of information, what is allowed? (Tick which items are allowed to be added or amended on either the bottle or the form)

Identifier	No change allowed	Change allowed on tube	Change allowed on request form
First name	☐	☐	☐
Last name	☐	☐	☐
Hospital number	☐	☐	☐
NHS/CHI number	☐	☐	☐
First line of address	☐	☐	☐
Date of birth	☐	☐	☐
Sex	☐	☐	☐
Date of sample	☐	☐	☐
Time of sample	☐	☐	☐
Name of person taking sample	☐	☐	☐
Signature	☐	☐	☐
Other	☐	☐	☐

6. If you allow additions or amendments, who is allowed to make them? (Tick as many as apply):

a) The person who collected the blood sample?	☐ Yes	☐ No
b) Someone authorised to do so by the person who collected the blood sample?	☐ Yes	☐ No
c) Anyone can make changes	☐ Yes	☐ No
d) Lab staff can make changes on behalf of the person who collected the blood sample?	☐ Yes	☐ No

Haemolysed samples

7. Does your laboratory have a SOP that covers the rejection of samples?	☐ Yes	☐ No
7a. If yes, does this SOP cover the rejection of haemolysed samples?	☐ Yes	☐ No

8. What criteria do you use to classify a sample as haemolysed ?

Visual by experience	☐
Visual by guide	☐
Determined by analyser	☐
Other (please specify)	☐

Click or tap here to enter text.

8a. Who makes this decision?

Analyser	☐
Transfusion support staff	☐
BMS 5	☐
BMS 6	☐
BMS 7	☐
Other (please state)	☐

Click or tap here to enter text.

Local reporting

9. Do you have systems or processes in place to collect and report the following?:

a) How many samples are rejected over a given time period	☐ Yes	☐ No
b) Where the rejected sample was received from	☐ Yes	☐ No
c) What the reason for rejection is	☐ Yes	☐ No

10. If you answered YES to Q9c, do you record the following reasons? (Tick as many as apply):

Core patient identifier(s) don't match on tube and form	☐ Yes	☐ No
Core patient identifier(s) missing from tube	☐ Yes	☐ No
Other required details missing from form	☐ Yes	☐ No
Core patient identifier(s) missing from form	☐ Yes	☐ No
Pre-printed label on tube	☐ Yes	☐ No
Other required details missing from tube	☐ Yes	☐ No
Current identifiers do not match historical identifiers	☐ Yes	☐ No
Unlabelled tube or form	☐ Yes	☐ No
Other required details don't match on tube and form	☐ Yes	☐ No
Illegible details on tube or form	☐ Yes	☐ No
Details overwritten	☐ Yes	☐ No
Grossly Haemolysed sample	☐ Yes	☐ No

11. If you answered YES to any part of question 10, how can the information collected be accessed? (Tick as many as apply):

a) local summary reports / graphs (not individual sample data)	☐
b) electronic data export (e.g. Microsoft Excel or CSV file)	☐
c) Other, please state:	☐

Click or tap here to enter text.

Audit participation

12. What is your preferred method for data collection?

Electronic submission*	☐
Online data collection form	☐
Paper	☐

**If you answered Yes to most statements in question 10 and are able to export this data into an excel or CSV file or report, you may be able to submit this export instead of collecting data manually*

APPENDIX TWO – LABORATORY AUDIT PROFORMA

Site Code:											
Date this sheet was started:	**Audited sample number** ***Do not include your local sample number if you are planning to return this form via freepost***										
Who took the blood sample?	Doctor										
	Nurse										
	Nursing associate										
	Midwife										
	Medical student										
	Student midwife										
	Physician associate										
	Anaesthetic associate										
	Health Care Assistant										
	Phlebotomist										
	ODA/ODP										
	Unknown										
Where was the blood sample taken?	A & E / Emergency Department										
	Medical Assessment Unit (or similar)										
	Surgical Assessment Unit (or similar)										
	Intensive Care Unit / HDU										
	Theatres / Recovery										
	Outpatient clinic / Pre-Op clinic										
	Phlebotomy department										
	Neonatal Unit										
	Paediatric ward or similar										
	Inpatient Ward										
	Day ward										
	Delivery suite										
	Community										
	Unknown										
When was the sample taken?	Core hours *(defined locally)*										
	Out of hours *(defined locally)*										
What was the reason for rejecting the sample?	Core patient identifier(s) missing from tube										
	Core patient identifier(s) missing from form										
	Core patient identifier(s) don't match on tube & form										
	Other required details missing from tube										
	Other required details missing from form										
	Other required details don't match on tube & form										
	Illegible details on tube or form										
	Unlabelled tube or form										
	Form not signed										
	Tube not signed										
	Pre-printed label on tube										
	Details overwritten										
	Current identifiers don’t match historical identifiers										

APPENDIX THREE – FREETEXT RESPONSES

Q4. Regarding mislabelled samples, which of these options best describes your practice: OTHER, PLEASE STATE

Cases of non repeatable samples ie fetal death
Clinical referral process for precious samples allowing concessionary processing but without additions or corrections to the sample label.
Concessionary release form is used on occassions by haematologist/consultant approval
Deviations considered dependant upon clinical situation/urgency
Exceptional cicumstances has to be referred to a consultant for approval disclaimer completed
Extrememly rare exception will process G&S only on sample that is 'precious' and risk to patient or clinician for repeat e.g. neonate, ultrasound guided venepuncture esp IVDU patients - in practice this has occurred on 2 occassions in last 10 years
For unrepeatable samples consulatant heamatologist may authorise processing of sample in exeptional circumstances. These exeptional issues are documented and reviewed at the HTT meeting
Genereally zero tolerance, however in exceptional situations (life threatening emergencies) a Consultant Haematologist may authorise acceptance of a very minor error (eg: 1 letter inorrect in name, minor error in DOB)
If details on card and sample do not match the information that comes across from the hospital patient system, laboratory contact ward and if sample and card correct we ask them to change the hospital ssytem We then process the sample when the hospital system shows the information matches the sample. If not we reject sample
In exceptional cirmcumstances an amendment would be allowed, dependent on what would needed to be amended. A form needs to be completed at the laboratory as long as the amedndent fulfils the criteria.
In extreme emergency, we will accept a sample that has the date, time, or signature missing at BMS discretion. Once the patient is stable, a reepat correctly labeleld sample is requested.
Lab only allows deviation on samples warranted to be acceptable to do so (extenuating circumstances). Not all samples can be amended. Sample taker and lab staff accepting change must complete a deviation forms which is recorded.
Laboratory allows minor mis-labelling for 'precious samples' with formal deviation from SOP process
Person identifying patient and taking sample can come to lab and add signature to the form only
Sample labels are not amended.
Request forms may have details added: date, time (by lab staff); name of the requestor, signature of the requestor (by the requestor).
Sometimes overridden by Haem Cons, but concession completed and no changes made.
The laboratory operates a zero tolerance policy, however in the case of a life threatening bleed, the clinician may contact the haematology consultant who may authorise correction of the error in addition to the completion of a disclaimer form.
With regards to question 5 the disclaimer protocol would only allow minor amendements rather than complete changes.
There is a consessions form that can be completed if the consultant haematologist agrees that the details can be amended due to exceptional circumstances and then the individual who took and labelled the sample can come and amend it and sign the form.
There may be a concession with precious sample but would require Consultant Haematologist approval. This is not normal practice, concessionary release only.

Under some very limited and authorised circumstances some samples are allowed to be accepted if there is a minor error on the labelling. A 'special circumstance' form is completed by the biomedical scientist.
Very rarely the lab may complete a deviation form for a precious sample

Q8. What criteria do you use to classify a sample as haemolysed ? OTHER, PLEASE SPECIFY

Grossly haemolysed samples should not be accepted unless the lysis occurred ‘in vivo’ e.g. patients with severe burns. Ward to be contacted if sample rejected
SOP specifies that haemolyzed samples are to be rejected but does not specify the criteria
We do have a visual guide but it is used in Coag rather than in transfusion. Some samples may be rejected by a BMS if visually very haemolysed but most of these samples will be put on the analyser as it may still be able to complete testing despite the haemolysis.

Q8a. Who makes this decision? OTHER, PLEASE STATE

BMS 8
BT Lead and/or Path Manager
consultant
Experienced staff, if it is a band 5 it would only be a band 5 who works on call, therefore experienced and competency assessed
If the BMS 5 was unsure they would seek advise from a more experienced BMS
Laboratory Manager 8a
SOP does not specify

Q11. If you answered YES to any part of question 10, how can the information collected be accessed? OTHER, PLEASE STATE

Access patient records on LIMS
All sample labelling rejects reported through local incident reporting system for investigation by liine manager and feedback to individual involved - Human Factors pro-forma in use to collate information re process
All samples rejected are recorded on Ulysses that can put reportsd on the reasons for rejection
Any rejected sample and /or form generates an incident report. We can use this system (datix) to pull this information. We also attach evidence of the error. Alternatively we could ask our pathology IT department
Clinical incident reporting system (TDBB) LIMS reports
EPIC (electronic patient record system) report
Information can be obtained from LIMS
Information collected from LIMS
Interrogation of the Laboratory Information System (LIMS)
LIMS Telepath gather
Manual data collection
Microsoft Word document updated manually by BMS staff
On Winpath which feeds information to Cerner and IceSunquest
Paper records

Sample rejection log
Samples that are unacceptable have a general comment added, but specific reasons for this would not be generated as part of a report. This information would be available if the BMS has entered a comment into the Winpath record to state the reason for rejection.
Search for investigation M 0 manual collectiuon of reasons applied as investigation
Stats from LIMS
The information is recorded by free text (and is well documented) but difficult to code so for the purposes of audit these are all classified as sample or form labelling errors
The information is recorded by free text (and is well documented) but difficult to code so for the purposes of audit these are all classified as sample or form labelling errors
They are reported as adverse incidents and collated on an excel spread sheet for discussion at HTT and HTC
This data was routinely captured and reported to HTC. The new LIMS system in Feb 2022 has prevented us from extracting this information as the organisation is still working through the building of informatics reports. As this is not business critical it has not yet been built.
This is available via WPE but would include rejected samples for all of blood sciences as all are rejected in the same way. It is unknown yet if EPIC will be able to be used to provide information.
We can request a LIMS search by pathology IT Dept. This gives us the raw data of all samples rejected and the reason why.
We collect monthly data on sample rejection via datix system

APPENDIX FOUR – LIST OF PARTICIPATING SITES

Addenbrooke's Hospital
Airedale NHS Foundation Trust
Alder Hey Children's NHS Foundation Trust
Altnagelvin Area Hospital
Aneurin Bevan University Health Board
Arrowe Park Hospital
Ashford and St. Peter's Hospitals NHS Foundation Trust
Barking, Havering and Redbridge University Hospitals NHS Trust
Basildon and Thurrock University Hospitals NHS Foundation Trust
Basingstoke & North Hampshire Hospital
Bedford Hospital NHS Trust
Belfast Health and Social Care Trust
Birmingham Children's Hospital
Birmingham Women's and Children's NHS Foundation Trust
Blackpool Teaching Hospitals NHS Foundation Trust
BMI The Ridgeway Hospital
Bradford Teaching Hospitals NHS Foundation Trust
Bristol Royal Infirmary
Broomfield Hospital
Calderdale and Huddersfield NHS Foundation Trust
Charing Cross Hospital
Chelsea & Westminster Hospital
Chesterfield Royal Hospital NHS Foundation Trust
City Hospital Campus
City Hospitals Sunderland NHS Foundation Trust
Colchester Hospital
Countess of Chester Hospital NHS Foundation Trust
Croydon Health Services NHS Trust
Cumberland Infirmary Carlisle
Darlington Memorial Hospital
Dartford and Gravesham NHS Trust
Doncaster and Bassetlaw Teaching Hospitals NHS Foundation Trust
Dorset County Hospital NHS Foundation Trust
Dumfries & Galloway royal infirmary
East and North Hertfordshire NHS Trust
East Cheshire NHS Trust
East Sussex Healthcare NHS Trust
Epsom Hospital
Fairfield General Hospital
Forth Valley Royal Hospital
Frimley Park Hospital
Furness General Hospital
Gateshead Health NHS Foundation Trust
Glan Clwyd Hospital
Gloucestershire Hospitals NHS Foundation Trust
Great Ormond Street Hospital For Children NHS Foundation Trust
Great Western Hospitals NHS Foundation Trust
Guy's & St Thomas' NHS Foundation Trust
Hammersmith Hospital
Harefield Hospital
Harrogate and District NHS Foundation Trust
HCA International Group Hospitals
Hywel Dda University Health Board
Ipswich Hospital
Isle of Wight NHS Trust
James Paget University Hospitals NHS Foundation Trust
Kent & Canterbury Hospital
Kettering General Hospital NHS Foundation Trust
King's College Hospital
Kingston Hospital NHS Foundation Trust
Lancashire Teaching Hospitals NHS Foundation Trust
Lincoln County Hospital
Liverpool Heart and Chest Hospital NHS Foundation Trust
Liverpool University Hospitals NHS Foundation Trust
Liverpool Women's NHS Foundation Trust
London North West University Healthcare NHS Trust
Luton and Dunstable University Hospital NHS Foundation Trust
Maidstone and Tunbridge Wells NHS Trust
Manchester University NHS Foundation Trust
Medway NHS Foundation Trust
Mid Cheshire Hospitals NHS Foundation Trust
Milton Keynes University Hospital NHS Foundation Trust
Morriston Hospital

NHS Fife
NHS Tayside
Norfolk and Norwich University Hospitals NHS Foundation Trust
North Bristol NHS Trust
North Devon district Hospital
North Middlesex University Hospital NHS Trust
North Tees and Hartlepool NHS Foundation Trust
North West Anglia NHS Foundation Trust
Northampton General Hospital NHS Trust
Northumbria Healthcare NHS Foundation Trust
Oxford University Hospitals NHS Foundation Trust
Pilgrim Hospital
Poole Hospital NHS Foundation Trust
Portsmouth Hospitals NHS Trust
Prince Charles Hospital
Princess of Wales Hospital Bridgend
Princess Royal University Hospital Farnborough
Queen Elizabeth Hospital Greenwich
Queen Elizabeth The Queen Mother Hospital
Queen's Hospital Burton
Queen's Medical Centre
Royal Berkshire NHS Foundation Trust
Royal Blackburn Teaching Hospital
Royal Brompton Hospital
Royal Cornwall Hospitals NHS Trust
Royal Derby Hospital
Royal Devon and Exeter hospital
Royal Free Hospital
Royal Glamorgan Hospital
Royal Hampshire County Hospital
Royal Lancaster Infirmary
Royal Marsden Hospital Chelsea
Royal Marsden Hospital Sutton
Royal National Orthopaedic Hospital NHS Trust
Royal Papworth Hospital NHS Foundation Trust
Royal Surrey County Hospital NHS Foundation Trust
Royal Sussex County Hospital
Royal United Hospitals Bath NHS Foundation Trust
Salford Royal NHS Foundation Trust
Salisbury NHS Foundation Trust
Sandwell and West Birmingham Hospitals NHS Trust
Sheffield Children's NHS Foundation Trust
Sheffield Teaching Hospitals NHS Foundation Trust
Sherwood Forest Hospitals NHS Foundation Trust
Singleton Hospital
Somerset NHS Foundation Trust
South Tees Hospitals NHS Foundation Trust
South Tyneside District Hospital
South West Acute Hospital
Southend University Hospital
Southport and Ormskirk Hospital NHS Trust
St. Bartholomew's Hospital
St. George's University Hospitals NHS Foundation Trust
St. Helens and Knowsley Teaching Hospitals NHS Trust
St. Helier Hospital
St. Mary's Hospital Paddington
St. Richard's Hospital
Stockport NHS Foundation Trust
Surrey and Sussex Healthcare NHS Trust
Tameside and Glossop Integrated Care NHS Foundation Trust
TDL Cleveland Clinic London
TDL Laboratory - Ealing Hospital NHS Trust
TDL Laboratory - Hospital of St. John's and St. Elizabeth, St. John's Wood
TDL Manchester
TDL Ramsay Rivers Hospital
TDL The Chaucer Hospital
TDL The Priory Hospital
The Dudley Group NHS Foundation Trust
The Leeds Teaching Hospitals NHS Trust
The Mid Yorkshire Hospitals NHS Trust
The Newcastle upon Tyne Hospitals NHS Foundation Trust
The Princess Alexandra Hospital NHS Trust
The Princess Royal Hospital, Haywards Heath
The Queen Elizabeth Hospital King's Lynn NHS Foundation Trust
The Robert Jones and Agnes Hunt Orthopaedic Hospital NHS Foundation Trust
The Rotherham NHS Foundation Trust

The Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust
The Royal Wolverhampton NHS Trust
The Shrewsbury and Telford Hospital NHS Trust
The Ulster Hospital
Torbay and South Devon NHS Foundation Trust
University College London Hospitals NHS Foundation Trust
University Hospital Lewisham
University Hospital Llandough
University Hospital of North Durham
University Hospital of Wales
University Hospital Southampton NHS Foundation Trust
University Hospitals Birmingham NHS Foundation Trust
University Hospitals Coventry and Warwickshire NHS Trust
University Hospitals of Leicester NHS Trust
University Hospitals of North Midlands NHS Trust
University Hospitals Plymouth NHS Trust
Walsall Healthcare NHS Trust
Warrington and Halton Hospitals NHS Foundation Trust
West Hertfordshire Hospitals NHS Trust
West Middlesex University Hospital
West Suffolk NHS Foundation Trust
Weston General Hospital
Wexham Park Hospital
Whittington Health NHS Trust
William Harvey Hospital
Worcestershire Acute Hospitals NHS Trust
Worthing Hospital
Wrexham Maelor Hospital
Wrightington, Wigan and Leigh NHS Foundation Trust
Wye Valley NHS Trust
Yeovil District Hospital NHS Foundation Trust
York & Scarborough Teaching Hospitals NHS Foundation Trust
Ysbyty Gwynedd