ORIGINAL ARTICLE

An audit of the indications for the reporting of blood films: results from the National Pathology Benchmarking Study

M J Galloway, J C Osgerby

J Clin Pathol 2006;59:479–481. doi: 10.1136/jcp.2005.035006

See end of article for authors' affiliations

Correspondence to:
Dr Michael J Galloway,
City Hospitals Sunderland
NHS Foundation Trust,
Sunderland Royal
Hospital, E Floor
Haematology Office, Kayll
Road, Sunderland SR4
7TP, UK; mike.galloway@
nhs.net

Accepted
21 December 2005

Background: The National Pathology Benchmarking Review has completed seven years of analysis of the workload of haematology laboratories in the United Kingdom.

Objective: To audit criteria that laboratories use for preparing blood films against guidelines published by the International Consensus Group for Haematology Review.

Methods: Each laboratory completed a standard questionnaire about the number of blood counts and blood films done each year. Information was collected on the criteria that were used for preparing a blood film and the manufacturer of the equipment used to carry out the full blood count.

Results: 46 NHS trusts (93 laboratory sites) participated in the study. There was wide variation in the criteria used for preparing blood films when compared with the consensus guidelines. The variation in practice appeared to be irrespective of the type of hospital or the manufacturer of the equipment used for the blood count.

Conclusions: There is a wide range in laboratory practice in preparing blood films. The publication of the consensus guidelines should help to standardise practice in this area. The next step in the study is to determine what the film review rate should be if these guidelines are implemented. This will then provide a benchmark of good practice which laboratories can use to assess their performance.

The National Pathology Benchmarking Study has completed seven annual cycles of comparative analysis of the work load and organisation of haematology departments in the United Kingdom.¹ The basis for the comparative study between laboratories is the national definition of tests and requests in haematology and blood transfusion that is used by the majority of laboratories. While a large part of the annual report concerns comparison of workload and costs between laboratories, the variation in practice between laboratories has also been studied. Examples of this include the different diagnostic testing strategies used in laboratories in areas such as folate testing² and thrombophilia testing.³ Previous reports from the Benchmarking Study have identified a wide range in the number of blood films that laboratories report.¹ In this study we therefore analyse the variation in the criteria that laboratories use to prepare blood films, in an attempt to explain this variation in laboratory practice. International consensus guidelines for the criteria for action following an automated blood count and white blood cell differential analysis have been published and these are the standards against which part of this audit was undertaken.⁴

METHODS

The methods for data collection and analysis for the pathology benchmarking study have been described previously.⁵ Laboratories participate in the study on a voluntary basis. Each laboratory completes a data collection questionnaire showing the number of tests undertaken by that laboratory on an annual basis. The haematology data collection pro forma collects workload information on a range of 90 laboratory tests and data on laboratory activity in relation to the preparation and issue of blood components and blood products. For comparative purposes laboratories are classified into one of four groups of hospitals: teaching hospitals (cluster T), and large (cluster A), medium (cluster B), or small (cluster C) district general hospitals. Teaching hospitals are those that include medical undergraduate and

postgraduate teaching centres, in addition to receiving regular tertiary referrals in several pathology subspecialties. These hospitals would also have several regional subspecialties on site. Cluster A hospitals are large district general hospitals serving a population of over 320 000, which have an annual budget of over £125 million and several regional subspecialties on site. Cluster C hospitals are small district general hospitals serving a population of less than 250 000, which have an annual budget of less than £75 million. Cluster B hospitals are district general hospitals that fit in between cluster A and cluster C hospitals. Other factors taken into account when allocating a hospital to a cluster are the number of beds and whether the hospital is a cancer centre or contains a cancer unit. Each respondent is asked to confirm whether they have been allocated to the correct cluster group.

For the purposes of this study a structured pro forma was included in the data collection analysis. This was based on a pilot study that had been run the previous year. The data that were collected included whether the laboratory had a standard operating procedure (SOP) for the indications for preparing a blood film. Information was also collected on the reasons behind films being prepared and not reported. In addition the minimum and maximum criteria that would initiate the preparation of a blood film for an adult patient unknown to the laboratory who had no other relevant history—for example, was not postoperative—were also collected as part of the pro forma. These criteria were compared with the numerical criteria published by the International Consensus Group.⁴ For the purposes of simplicity the various flags that were included in the guidelines were not included in this audit.

To determine if there was a relation between the number of films reported as a percentage of full blood counts and the manufacturer of the equipment that performed the full blood count, a statistical analysis was undertaken using the SPSS, version 12.0. All data were tested for homogeneity of variance

Abbreviation: SOP, standard operating procedure

Figure 1 The number of blood films with (empty bars) and without (filled bars) reports, as a percentage of full blood counts (FBCs) in 2003/2004. Each bar on the chart represents a haematology department. The bars have been grouped according to the size of the hospital in which the department resides: T, teaching; A, large district general hospital; B, medium sized district general hospital.

before analysis. Where data were homogeneous, a one way analysis of variance (ANOVA) was used. Where data were non-homogeneous, a Kruskal–Wallis non-parametric ANOVA was used. Data were considered statistically significant at p values of ≤ 0.05 .

RESULTS

Forty six NHS trusts submitted data for the annual pathology benchmarking study for the financial year 2003/2004. Fifteen were teaching hospitals (cluster T), 14 were large district general hospitals (cluster A), and 17 were medium sized district general hospitals (cluster B). Following various trust mergers there were no cluster C hospitals in this year's study. Of these 46 NHS trusts many had laboratories on several sites, and the total sample size was 93 individual laboratory sites. For the purposes of this study, however, 46 NHS trusts are assessed as 46 laboratories as the testing patterns were the same within each trust.

Figure 1 shows the number of blood films with and without a report as a percentage of full blood counts for each of the trusts. Five manufacturers of full blood count analysers were represented in this study and there was no relation between the manufacturer and the number of blood films prepared as a percentage of full blood counts or between the manufacturer and the number of blood films reported ($p > 0.05$).

Forty two of the trusts had an SOP for the indication for preparing a blood film. In only nine trusts was the criterion for the SOP included in the laboratory information system

that would automatically generate a request for samples requiring a blood film. The majority of laboratories used the SOP in a manual way—that is, the biomedical scientist reviewed a work list produced by the laboratory information system on samples that might require a blood film, and then the biomedical scientist determined whether a blood film is made.

When asked why blood films were prepared and then not reported, the majority of laboratories stated that this was as a result of criteria used in their laboratory information system. Where a blood film was prepared but subsequent review by a biomedical scientist indicated that it was not necessary, the film was not reported.

Table 1 shows the minimum and maximum criteria that laboratories use as criteria for preparing blood films and compares them against the consensus guidelines.⁴ As can be seen the numerical criteria used by laboratories when deciding whether a film is necessary varied widely.

DISCUSSION

This study showed a wide range in the number of blood films that are prepared as a percentage of blood counts, irrespective of hospital type. In addition we were not able to demonstrate any influence of the type of analyser manufacturer on the percentage of blood films that were prepared. However, the relatively small numbers of laboratories that were using the different types of analyser in the study is a limiting factor, which may have underpowered this part of the study. In addition some trusts used more than one manufacturer

Table 1 Minimum and maximum criteria that laboratories use when determining if a blood film is required for a previously unknown adult patient

	Minimum range (median)	Consensus guideline minimum ⁴	Maximum range (median)	Consensus guideline maximum ⁴
Hb (g/dl; female)	7 to 12 (10)	<7	15 to 20 (17)	2 g/dl above reference range
Hb (g/dl; male)	7 to 13.5 (10)	<7	15 to 20 (18)	2 g/dl above reference range
WBC $\times 10^9/l$	2 to 4 (3)	<4	10 to 30 (20)	>30
Platelets $\times 10^9/l$	10 to 150 (120)	<100	400 to 800 (600)	>1000
Neutrophils $\times 10^9/l$	0.5 to 2.5 (1.5)	<1	7.5 to 30 (17.5)	>20
Lymphocytes $\times 10^9/l$	0.1 to 1.5 (1)	–	3.5 to 10 (4.5)	>7
Monocytes $\times 10^9/l$	–	–	0.8 to 3 (1.5)	>1.5
Eosinophils $\times 10^9/l$	–	–	0.4 to 5 (1.3)	>2.0
Basophils $\times 10^9/l$	–	–	0.02 to 2.5 (0.35)	>0.05
MCV (fl)	60 to 80 (75)	<75	99 to 125 (101)	>105

Hb, haemoglobin; MCV, mean corpuscular volume; WBC, white blood cell count.

Take home messages

- There is a wide range in the number of blood films prepared as a proportion of total blood counts, irrespective of hospital type.
- The publication of the consensus guidelines should help standardise practice in laboratory haematology.

across different sites and this is another limiting aspect of this part of the study. Single institutional comparative studies of analysers made by different manufacturers have shown that the type of analyser has an impact on the number of blood films that need to be reported.⁶

Many laboratories will have attempted to reduce the number of blood films that are prepared as a result of economic pressures on costs, as well as shortages of staff.⁷ Another factor influencing the percentage of blood films is the increasing capability of automated analysers to interpret routine full blood counts. Thus the laboratories have been left in a position whereby there is a difficult balance between relying on the automated analyser to produce all the relevant information or manually reviewing a blood film, the aim of the manual review being to ensure that patient care is not compromised by reporting false or misleading results, especially false negative results.⁸ As a result each laboratory has devised its own criteria for preparing a blood film. With this background the International Consensus Group for Haematology has developed consensus guidelines on the indications for preparing blood films. The rules in the guidelines include both numerical values, which have been part of this audit, together with suspect flags indicating the

presence of abnormal cells. We deliberately excluded the suspect flags from this audit for the purposes of simplicity, in view of the numerous types of flags that are available from the different manufacturers.

The next step in this audit is to study the impact of implementing these consensus guidelines on the number of blood films that need to be reviewed. This will then allow a benchmark of good practice to be developed, against which laboratories can compare their practice.

Authors' affiliations

M J Galloway, Department of Clinical and Laboratory Haematology, Sunderland Royal Hospital, Sunderland, UK

J C Osgerby, Clinical Management Unit, Centre for Health Planning and Management, Keele University, Keele, Staffordshire, UK

REFERENCES

- 1 **Galloway M**, Holland D, Osgerby, et al. Pathology Benchmarking report – haematology and blood transfusion 2003/2004. Keele: Keele University, 2005.
- 2 **Galloway M**, Rushworth L. Red cell or serum folate? Results from the National Pathology Alliance benchmarking review. *J Clin Pathol* 2003;**56**:924–6.
- 3 **Lyons S**, Galloway MJ, Osgerby J, et al. An audit of thrombophilia screens – results from the National Pathology Alliance benchmarking review. *J Clin Pathol* 2006;**52**:156–9.
- 4 **The International Consensus Group for Haematology Review**. Suggested criteria for action following automated CBC and WBC differential analysis. *Lab Haematol* 2005;**11**:83–90.
- 5 **Galloway M**, Nadin L. Benchmarking and the laboratory. *J Clin Pathol* 2001;**54**:590–7.
- 6 **Johnson M**, Samuels C, Jozsa N, et al. Three way evaluation of high throughput haematology analyzers – Beckman Coulter LH750, Abbott Cell-Dyn 4000, Sysmex XE-2100. *Lab Hematol* 2002;**8**:230–8.
- 7 **Mcfaden S**. Automating the review process to improve productivity in the hematology laboratory. *Lab Hematol* 2002;**8**:225–9.
- 8 **Peterson P**, Blomberg DJ, Rabinovitch A, et al. Physician review of peripheral blood smear: when and why. *Lab Hematol* 2001;**7**:175–9.