A follow-up audit of the completion of bone marrow specimen request forms at an academic laboratory

L Budding,¹ MJ Coetzee,² G Joubert³

¹Department of Anatomical Pathology, School of Pathology, Faculty of Health Sciences, University of the Free State and National Health Laboratory Service, South Africa

²Department of Haematology and Cell Biology, School of Pathology, Faculty of Health Sciences, University of the Free State and National Health Laboratory Service, South Africa

³Department of Biostatistics, School of Biomedical Sciences, Faculty of Health Sciences, University of the Free State, South Africa

Corresponding author, email: coetzeejm@ufs.ac.za

Background: In order to ensure that patients receive individualised treatment following bone marrow biopsy, it is necessary for clinicians to provide complete clinical information on bone marrow request forms (BMRFs). An audit of BMRFs six years previously showed poor completion, especially with regard to filling in full blood count results, transfusion history, medication history, information about the clinical examination and HIV status. This led the laboratory to design a new bone marrow specimen request form. We did a follow-up audit to see if the new form had helped to improve the completion rates.

Methods: We compared 400 forms to the 357 that were audited in 2013. The following details were recorded: date and time of collection, patient demographics, requesting doctor's details, clinical information, current medication, transfusion history and HIV status, and details of the procedure completed by technologists, registrars and pathologists.

Results: The 2019 follow-up audit showed significant improvements in the completion of the transfusion history, as well as the clinical examination and HIV status. Registrars and pathologists signed off forms regularly. The completion of patient demographic details, and requesting doctors' names and telephone numbers worsened.

Discussion and conclusion: We recommend that the form be simplified so the requesting doctors only need to tick yes or no, in a tick-box format, if a full blood count has been done in the preceding 24 hours. There needs to be a dedicated space for the hospital and laboratory stickers. Only the name and telephone number of one doctor should be requested. This doctor should preferably be the most senior doctor involved with patient care. All referring laboratories and hospitals will be consulted before updating the form. Unfortunately, it seems that the only way to force the completion of request forms is to introduce an electronic order entry system that does not accept incomplete forms.

Keywords: bone marrow examination, laboratory request forms, preanalytical phase, haematology, clinical audit

Introduction

Incomplete laboratory request forms remain a common pre-analytical error in haematology.^{1,2} Properly completed bone marrow request forms (BMRFs) can guide haematologists to focus on a clinically relevant diagnosis and can help them to request appropriate additional tests. Coetzee et al.³ reported an audit of the completion of BMRFs received over a period of four months in 2013 at the Universitas Academic Laboratories of the National Health Laboratory Service (NHLS) in Bloemfontein. Full blood count (FBC) results were absent on 57.7%, the transfusion history on 29.1%, the medication on 23.8%, and information about the clinical examination and HIV status on 9.2% of forms. Inaccurate and incomplete reporting on specimen request forms may lead to negative patient outcomes⁴ and can contribute to increased turn-around times. In an attempt to encourage the completion of patient identifiers and clinical information, the laboratory introduced a new BMRF in 2013 (see Figure 1). It was distributed to all laboratories that refer bone marrow specimens to Bloemfontein after the users had been informed. The aim

of this current update was to evaluate whether the new BMRF resulted in improved completion of the form.

Methods

To assess whether the new BMRF improved the completion, a follow-up audit was done on BMRFs submitted to the Universitas NHLS Haematology Laboratory over a period of four months in 2018. A retrospective, cross-sectional study was conducted. A sample of 400 request forms was analysed and compared to the 357 BMRFs from the 2013 audit. The completion of the following aspects were recorded:

- Date and time of collection of specimen.
- Patient demographics.
- Requesting doctor's details.
- Clinical information i.e. current medication, transfusion history and HIV status.
- Other laboratory tests requested.
- Details of the procedure completed by attending technologists.

BONE MARROW REQUEST FORM		
Department of Haematology and Cell Biology, UFS and NHL; Tel (051) 405 3887		
Date:	Time:	
Patient details (sticker if possible)		
Surname, Name	Male	Female
Date of birth		
Hospital no. (UM, PM, etc.)	Hospital	Ward

ICSH guidelines for the standardization of bone marrow specimens and reports. International Journal of Laboratory Hematology 2008;30:349–364.

No bone marrow will be processed without an accompanying FBC having been done in the last 24 hours!

Has FBC has been done in the last 24 h	Signature of doctor	
Requesting consultant:	MP number	Contact No:
Requesting doctor:	MP number	Contact No:
Clinical background:		
Indication for bone marrow		
Previous bone marrows?		
Medication (e.g. current chemotherapy cycle, date, herbal medication, supplements)		
Recent bleeding?		
Recent Blood Transfusions (and pre-transfusion Hb)		
Splenomegaly? (cm)	Hepatomegaly? (cm)	
Lymphadenopathy? where and size (cm)		
HIV status:	Positive	Negative
		Not disclosed

BONE MARROW SPECIMENS IN ORDER OF DRAW

		Test	Volume	Please Sign if obtained
1	Compulsory	Aspirate slides	0.5 mL	
2	Compulsory	Purple (EDTA) (flow and molecular tests)	1-2 mL	
3	Compulsory	Green (heparin) (FISH)	1-2 mL	
4	Compulsory	Green (heparin) with medium for karyotyping	1-2 mL	
5	Optional	TB/Fungal culture (in culture bottle)	1-5 mL	
6	Compulsory	Trephine	At least 2 cm (adults)	Length:
7	Optional	Imprint if aspirate unsuccessful		

Additional requests

Molecular and cytogenetic tests will be requested by pathologists once the specimen has been reviewed

FOR LAB USE ONLY		Referral Laboratories: attach most recent FBC printout and PB smear	
Samples received:			
BM Asp Yes/No	Purple EDTA BM Yes/No	Cytogenetics FISH BM Yes/No	
Cytogenet. medium BM Yes/No	TB/Fungal culture Yes/No	Trephine Yes/No	
Trephine length (cm)	Imprint Yes/No		
Notes:			
Smears made by:	Reported by:	Signed off by pathologist:	

Figure 1: New bone marrow request form

Results were summarised by frequencies and percentages and the two audits compared using chi-squared tests or Fisher's exact tests in the case of sparse cells. The categories were only considered to be complete if all the criteria were completed on the BMRF. Approval was obtained from the Health Sciences Research Ethics Committee of the University of the Free State (UFS-HSD2019/0325/2603) and laboratory authorities.

Results

The results are shown in Figure 2. The 2019 follow-up study showed the following improvements:

- Transfusion history was now only absent on 22.3% ($P < 0.0001$).
- Clinical examination and HIV status were now absent on 1.3% of forms ($P = 0.0029$).

Figure 2: Comparison of percentage incomplete items on the request forms between the 2013 study (Coetzee et al.)³ ($n = 357$) and the follow-up audit in 2019 ($n = 400$). The order of the items on the y-axis follows their sequence on the request form.

- The proportion of forms lacking registrars' signatures decreased from 31.9% to 4.5% ($P < 0.0001$).
- The forms without pathologist signatures decreased from 16.0% to 6.0% ($P < 0.0001$).

Some laboratories modified the form so that requesting doctors only had to tick that a FBC was done in the last 24 hours. The pathologists could then retrieve the results from the laboratory information system. We, therefore, were not able to audit the completion of FBC results. The requests for additional tests were also too different to compare between the previous BMRF and the newly implemented form.

The space for patient stickers on the new form was not large enough, so that stickers often covered parts of the space for patient demographics. Sometimes doctors only used abbreviated stickers that did not include the patient's first name(s), date of birth or sex. These abbreviated stickers did, however, include the hospital number, which meant that the correct patient demographics were transferred from the hospital to the laboratory information system. The stickers often obstructed the space for the date of the specimen collection. It is necessary to know the time that the specimen was collected in order to determine whether the specimen is viable for flow cytometry or genetic investigations.

The doctor's name and contact details on BMRFs are required in case the laboratory has questions about the patient. Coetzee et al.³ found that the BMRFs were often completed by junior doctors, who did not know enough about the patient to be able to answer questions from pathologists. They therefore added a space for the consultant's details on the BMRF. This part of the BMRF was poorly completed, with 32.8% of the forms having no contact details of either requesting consultant or requesting doctor, compared to 5.6% in 2013 ($P < 0.0001$). Similarly, the requesting doctor's name was absent from 21.3% of BMRFs, compared to 2.0% in 2013 ($P < 0.0001$).

Discussion and conclusion

To our knowledge these are the only reported audits of BMRFs. Due to the design of the new BMRF, some sections of the form were inadvertently poorly completed by clinicians. We therefore recommend that the following changes be made to the form:

1. The question regarding whether an FBC has been done in the last 24 hours should be presented in tick-box format with options for clinicians to tick "yes" or "no." The FBCs can then be retrieved from the laboratory system.
2. There should be dedicated spaces for both the hospital sticker and the laboratory barcoded stickers.

3. Only one doctor's name and contact details (preferably the most senior doctor who would be able to answer pathologists' questions regarding the patient) should be requested.

We did not include an audit of the additional tests that were requested because the layout of that part of the new BMRF has changed significantly. At Universitas NHLs Haematology Laboratory, only haematologists and pathology registrars are allowed to request flow cytometry and cytogenetics when appropriate. This has reduced the number of unnecessary requests by clinicians.

Before the implementation of the next version of a request form, we will consult with more laboratories (in private and public), pathologists, clinicians and registrars than we had done previously. This will ensure better buy-in from all parties and will ensure an updated BMRF that is suitable for most haematology departments. The guidelines of the International Council for Standardization in Hematology (ICSH)⁵ and the South African National Pathology Group (NPG)⁶ provide guidance concerning request forms. However, the only way to ensure that laboratory request forms are adequately completed is to introduce an electronic order entry system⁷ that will not accept incomplete request forms. Standard operating procedures for patient identification and specimen collection⁸ need to be promoted so that specimens comply with ISO 15189:2012⁹ requirements.

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Conflict of interest

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Ethical approval

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ORCID

L Budding <https://orcid.org/0000-0002-4284-1866>

MJ Coetzee <https://orcid.org/0000-0003-2762-0966>

G Joubert <https://orcid.org/0000-0002-3728-6925>

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