AN AUDIT OF THE COMPLETION OF BONE MARROW SPECIMEN REQUEST FORMS AT AN ACADEMIC LABORATORY

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SUMMARY

Background: Bone marrow request forms contain clinical information for the diagnosis of haematological conditions. Because these forms were not being completed adequately we introduced a structured request form in the Free State Province and performed an audit to see how it was completed.

Methods: During four months in 2013 we received 357 requests. We recorded the completion of the time and date, patient details, doctor's details, full blood count (FBC) results, clinical information, transfusion details, other laboratory tests requested, and details of the procedure completed by technologists.

Results: The patient's 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. The technologist had not signed on 27.4%, and details of additional tests were missing on 23.3%.

Conclusion: The lack of completion is similar to those reported for other laboratory request forms. We began to educate students and doctors about the importance of clinical information.

KEYWORDS

Bone marrow examination, laboratory request forms, hematology, clinical audit, clinical laboratory services

INTRODUCTION

The request for a laboratory test begins with a question in the mind of the treating doctor. The results of the laboratory test aims to answer the question or to lead to other questions, thus closing the brain-to-brain loop of laboratory testing. The laboratory haematologist integrates clinical information with laboratory findings in order to arrive at a clinically relevant diagnosis. However, approximately 70% of “laboratory errors” occur before the specimen is analysed. Incomplete test request forms continue to contribute to these errors.

Bone marrow aspirations and biopsies are invasive procedures that are only done if a diagnosis cannot be made on peripheral blood. Currently common indications at our institution include unexplained thrombocytopenia, anaemia, haematological malignancies, staging of non-haematological cancers, and HIV-associated cytopenias. The bone marrow sample is examined under the microscope, and depending on the context, it is also submitted for flow cytometry, various genetic tests, or for culture. The decision regarding additional tests is urgent, as fresh samples yield better information. Adequate clinical information is vital for the diagnosis of haematological malignancies as details such as organomegaly and lymphadenopathy guide the selection of tests. Accurate demographic information prevents common pre-analytical errors.

The National Health Laboratory Service (NHLS) Haematology Laboratory at Universitas Academic Hospital receives bone marrow specimens from the eastern part of the Northern Cape, and the entire Free State. Most of the specimens come from the Pelonomi Regional Hospital and Universitas Academic Central Hospital, both in Bloemfontein. The laboratory provides tertiary paediatric and adult clinical haematology and oncology services for both diagnosis and monitoring. In 2013 we received 676 bone marrow aspirates and 882 trephine biopsy specimens. Most of the bone marrow procedures are done by clinical staff like registrars and medical officers. Our medical laboratory technologists assist them by making the aspirate smears and biopsy imprints.

The consequence of the incorrectly completed bone marrow request forms was that our registrars spent hours on the telephone obtaining missing clinical information that was important for the diagnoses. New genetic tests for haematological malignancies had been introduced, but these were often not ordered appropriately. This had a negative impact on the quality of diagnosis and turnaround time.

We introduced a new bone marrow request form in 2012 that we hoped would improve the quality of information received by the laboratory. The purpose of this audit was to establish how well these forms were being completed.
MATERIALS AND METHODS

In cooperation with the Human Genetics laboratory and our colleagues in clinical haematology and oncology we developed a form that had tick boxes and spaces to make it easy for the doctor to enter important clinical information. It also had tick boxes as an aide-memoire for related laboratory tests. The heads of these units introduced the forms to their units and taught their staff to complete the forms, with the aim of improving patient care. We discussed it at clinicopathological meetings prior to its introduction. The form (see Figure 1) complied with the ISO 15189:2012 requirements for medical laboratories and has most of the fields suggested by the International Council for Standardization in Hematology (ICSH). We distributed the forms as widely as possible through the NHLS laboratories in our region in January 2012.

We undertook a retrospective audit of the 357 bone marrow request forms received from January 2013 to April 2013. All bone marrow request forms were included, whether old or new versions. Approval was obtained from the Ethics Committee of the Faculty of Health Sciences of the University of the Free State (STUD 41/2013) and laboratory authorities. The completion of the following aspects were recorded: time and date of the procedure, patient details, doctor’s details, basic full blood count (FBC) results, clinical information, transfusion details, other laboratory findings, and any medication (e.g., any medication, current chemotherapy cycle and dose of last treatment, herbal medication).

![Figure 1. The new bone marrow request form.](image1)

For more information, please refer to the original document.
Some referring laboratories used old request forms, so that 32.2% (115/357) had no specific space for noting additional tests that were requested with the specimen.

The medical student researchers found 29.7% of the doctors’ handwriting on the request forms to be illegible. The doctor’s name was absent on 2.0% and telephone number on 5.6% of forms. This made it difficult to obtain missing information.

The full blood count (FBC) values that prompted the decision to request the bone marrow were absent in 57.7% of the forms. On 29.1% of the forms there was no transfusion history.

**RESULTS**

The results are summarised in Figure 2 in order of prevalence.

![Figure 2. Percentage of incomplete items on the request forms.](image)

![Figure 3. Comparison between the present study and that of Nutt et al. (2008) in the chemical pathology laboratory of an academic hospital.](image)
There was no information about treatment on 23.8% of the forms. The absence of the time of collection on 22.7% and date on 3.4% of the forms is worrying.

Telephone calls to clinicians were seldom documented. Only 13 records of phone calls could be found on the laboratory information system.

**DISCUSSION**

The study is limited by the fact that we did not collect data about the completion of previous forms for comparison. The personnel unanimously felt that there was a huge improvement compared to previous years.

Incorrect completion of 2% of the specimen’s forms required the laboratory to make phone calls to the requesting doctors. Incorrect completion of the forms, compounded by illegible handwriting can lead to serious laboratory transcription errors. [10] Fortunately the NHLS subsequently enforced the rejection of any specimens that did not identify the patient and doctor clearly. This has increased compliance.

The FBC values that prompted the decision to request the bone marrow are important for the diagnostic triage of the bone marrow. By the time the bone marrow procedure is done, patients have often received transfusions. The lack of this information can obscure the laboratory’s attempt to answer the clinician’s question.

The specific clinical information was only absent on 0.8% of forms. This is better than the 20% found by Nutt et al. [3] (see Figure 3). Clinical information is vital for the diagnosis of haematological malignancies. [11] The absence of information regarding treatment on 23.8% of forms is worrying. The bone marrow can by suppressed by the disease process or its treatment. In both cases information about treatment is critical. The absence of details of the clinical examination and possible HIV infection lead the laboratory staff to make many unnecessary phone calls and searches on the laboratory information system. In dermatopathology clinical information is just as important. Rademaker et al. [12] report that 37% of the requests forms of 375 consecutive skin specimens contained no useful clinical information.

The laboratory personnel left out some details that they had to complete in up to 31.9% of forms. This was subsequently been addressed by emphasizing the importance of noting details such as that an aspiration was done without submitting a specimen for flow cytometry or a trephine biopsy.

The pattern of absence of information from our request forms is similar to that reported by Nutt et al. [3] except that in our study the absence of time of collection was more prevalent (see Figure 3). Olayemi et al. [13] studied the completion rate of general haematology request forms. As in our study, the most frequent data that was absent was the time of collection (see Figure 4). This is of importance as the age of the specimen is critical for flow cytometry [14] and some genetic assays. Unfortunately the pattern of absence of information in our study mimics those of Nutt et al. [3], Olayemi et al. [13] and Jegede et al. [15]

If the requests for bone marrow investigations were completed online in an order entry the system would not accept incomplete requests. This would prevent any incomplete forms from being submitted. [16] However, many of our referring hospitals are rural and do not have electronic information systems at this stage.

We have tried to address the completion rate by introducing a lecture on the optimal use of a laboratory in our undergraduate medical curriculum, as well as offering tutorials on bone marrow sampling for interns. The Royal College of Pathologists mentions the topic in the Knowledge, skills and behaviours essential for working with Pathologists section of the Pathology Undergradu-
It is probably by developing and improving such interaction between clinicians and laboratories that the completion of bone marrow request forms will improve. It is our impression that the formatting of the form might contribute to poor completion of the lower sections. Some of the wording might be ambiguous. Subsequent to the audit it became apparent that the junior doctors often requested inappropriate or incorrect genetic tests, or unnecessary flow cytometry. This leads to waste of resources. In collaboration with Human Genetics we have decided to remove the options for additional appropriate or incorrect genetic tests, or unnecessary flow cytometry. We gave the pathologists sufficient clinical information? The New Zealand Medical Journal 2011; 123:53-8. https://www.nzma.org.nz/journal/read-the-journal/all-issues/2010-2019/2010/vol-123-no-1325/article-ramakrishnan (accessed 2016-07-11).


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AUTHORS’ CONTRIBUTIONS

MJC had the research idea and MS, AS, MK, and HK wrote the protocol and performed the research under his guidance. He wrote the manuscript. CJ provided input on the protocol as leader of the undergraduate research module, performed the statistical calculations, and edited the manuscript.

DISCLOSURE

No competing ﬁnancial interests or other conﬂicts of interest exist for any of the authors.