

Trained nurses can obtain satisfactory bone marrow aspirates and trephine biopsies

S Lawson, S Aston, L Baker, C D Fegan, D W Milligan

Abstract

Aims—To assess the feasibility of training nurse practitioners to perform bone marrow aspiration and trephine biopsy, and to compare the quality of these samples with those obtained by medical staff.

Methods—A retrospective audit was undertaken of nurse practitioner and medical staff performance in bone marrow procedures in a busy haematology day unit.

Results—Nurse practitioners fared favourably in comparison with medical staff in performing bone marrow trephine biopsies, with mean biopsy lengths of 11 mm and 10.7 mm respectively. However, only 78% of the smears obtained by the nurses were judged technically satisfactory, compared with 91% prepared by doctors. This discrepancy was thought to be due largely to the quality of slide spreading.

Conclusions—With motivated staff and a structured educational and training programme it is possible for nurse practitioners to perform the techniques of bone marrow aspiration and biopsy, and obtain specimens of satisfactory quality, thus improving efficiency of the haematology day unit and increasing quality of patient care.

(*J Clin Pathol* 1999;52:154-156)

Keywords: bone marrow aspiration; trephine biopsy; nurse practitioner

The haematology day unit at Birmingham Heartlands Hospital is a busy unit attached to the haematology ward where clinical procedures are undertaken, including administration of chemotherapy, venesection, and bone marrow aspiration and biopsy. An audit of practice on the day unit identified long waiting times for clinical procedures performed by doctors, resulting in unnecessary patient anxiety and frustration.

Recent years have seen changes in the pattern of medical staff training with the introduction of the "new deal for junior doctors."¹ These changes have effectively reduced the time available to trainee doctors to spend on the hospital wards, and thus less time is available for performing minor procedures such as venesection and bone marrow aspiration and biopsy. The introduction of the "Scope of professional practice for nurses, midwives and health visitors" by UKCC in 1992² emphasised nurses' autonomy and accountability, and enabled them to enhance and widen their range of practice.

In view of these changes in the roles of nurses and junior doctors we decided to re-examine tasks historically undertaken by doctors in the United Kingdom in order to establish whether some could be effectively carried out by the nursing staff on the day unit. We expanded the role of the nurse practitioner with the aim of enhancing patient care and promoting practice within the nursing team. We began this development by first teaching the techniques of venepuncture, venesection, and peripheral venous cannulation. An audit of this practice during the period of August 1996 to February 1997 showed that nurses were performing 70% of venous cannulations, 87% of venepunctures, and 90% of venesections, resulting in more efficient running of the unit. Patient waiting times were reduced and patient satisfaction increased. In view of these findings this practice was extended to bone marrow aspiration and trephine biopsy.

Methods

Two senior members of the nursing team working full time on the haematology day unit were trained to undertake bone marrow aspiration and trephine biopsy from the posterior iliac spine.

A comprehensive educational and training programme was developed and this was followed throughout training. The programme contained set competencies to ensure that the nurses undertaking training were aware of the issues of accountability and responsibility related to advanced nursing practice. These competencies included:

- anatomy of the pelvis and physiology of blood formation;
- the implications and responsibilities of bone marrow procedures;
- selection of an appropriate biopsy site;
- preparation of slides.

The nurses were trained by dedicated members of the medical staff (registrar and senior registrar), and were supervised over a period of at least two months, until both the trainer and the nurse were confident of the operator's ability. The number of supervised procedures performed to reach satisfactory competence was five for bone marrow aspiration and seven for trephine biopsy. All patients referred for marrow aspiration/biopsy were assessed by a member of the medical team who completed a written request form identifying the required investigation as well as any ancillary tests (immunophenotyping, cytogenetics, and so on). The patients were informed that the test would be carried out by a nurse and verbal informed consent was obtained before the

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Accepted for publication
2 October 1998

Table 1 Comparison of performance between nurse practitioners and doctors in obtaining marrow aspirates and trephine biopsies

	Marrow aspirate		Trephine biopsy
	Satisfactory	Unsatisfactory	Mean length (mm)
Nurse	40 (78%)	11 (22%)	11 mm
Doctor	63 (91%)	6 (9%)	10.7 mm
	p < 0.05		p = 0.07

procedure was undertaken; if sedation³ was planned, care was taken to ensure that the patient was accompanied after the test by a competent carer.

Sedation was rarely used in the case of bone marrow aspiration, but midazolam, 5–15 mg intravenously, was given to the majority of patients having a trephine biopsy. This was prescribed by the medical staff on the bone marrow request proforma, and was administered by the nurse practitioner. There was no difference between the quantity of sedation used in patients having a bone marrow test performed by doctors and those treated by nurses. A member of the medical team was required to be on the day unit or adjacent ward, and immediately available if required for the duration of the procedure and until the patient had recovered satisfactorily from the sedation. A retrospective blind audit of the quality of bone marrow aspirates and trephine biopsies taken by both nursing and medical staff (specialist registrars) was performed over an eight month period. Aspirates were assessed according to number of particles, cellularity, and spread and they were subsequently classified as either satisfactory or unsatisfactory for morphological interpretation. Trephine biopsies were assessed for quality by measuring their length after histological mounting. In a separate audit, waiting times were recorded from the time of arrival in the day unit to starting the procedure. In addition, a sample group of 30 patients completed a questionnaire about their satisfaction with the test.

Simple statistical analyses were applied to the results to assess significance (Student's *t* test, χ^2 test).

Results

The total number of bone marrow aspirate and biopsy procedures performed in the day unit

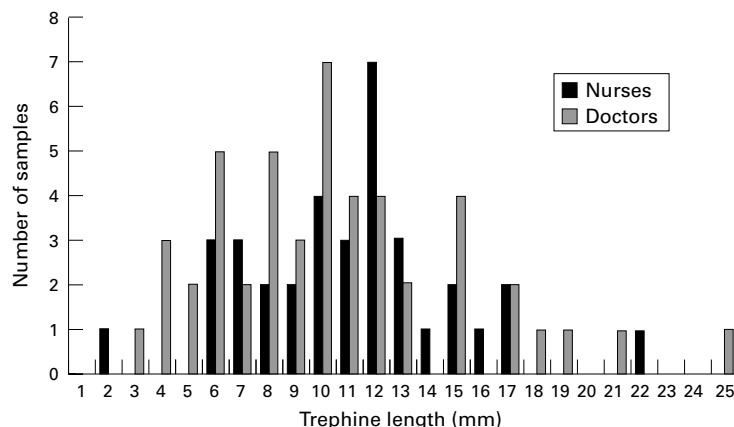


Figure 1 Length of trephine biopsies performed by nurses and doctors.

over the sample period was 120 and 84, respectively. The nurse practitioners carried out all bone marrow procedures unless the patient specifically requested a doctor or the nurse was otherwise busy. At the time of the audit the nurse practitioners were performing 41% of all bone marrow procedures. This low percentage mainly reflected the availability of the nurse for the procedures, as for the majority of the audit period only one had been fully trained.

Assessment of the quality of bone marrow aspirates as either satisfactory or unsatisfactory for interpretation showed that 78% of those performed by the nurse practitioner were satisfactory, compared with 91% of those performed by doctors (table 1). This difference was significant ($p < 0.05$, χ^2 test) and was largely a result of the quality of the spread of the aspirates rather than the number of particles or cellularity.

Assessment of the length of trephine biopsies showed that those taken by the nurse practitioner had a mean length of 11 mm (range 2 mm to 22 mm), and those of doctors were of mean length 10.7 mm (range 3 mm to 25 mm) (fig 1). This difference was not statistically significant ($p = 0.7$, Student's *t* test). Patients waited less long to be treated by the nurses than by doctors (mean wait 18 minutes and 33 minutes, respectively, $p < 0.05$).

Few problems were encountered during the training process. Time, however, became an issue if patients arrived later than the appointed time, or if they requested sedation, when the procedure could not be carried out until a doctor became available. The nurse practitioner found the spreading of slides difficult initially, but with practice this became easier.

The results of the patient questionnaire were difficult to interpret. In the nurse practitioner group of patients, 70% would prefer a nurse to repeat the test and 30% had no preference between a nurse and a doctor. Among the patients who had the procedure carried out by a doctor, 82% favoured having a doctor again and 18% had no preference. Five patients had the test repeated at intervals by both a nurse and a doctor; of these, four had no preference and one would prefer a nurse practitioner in future.

Discussion

Widening the role of the nurse practitioner to incorporate tasks historically undertaken by medical staff may improve the service received by patients, particularly in the outpatient setting.

The results of our audit indicate that appropriately trained nurses can perform bone marrow biopsies and obtain specimens of a quality equal to that obtained by medical staff. With respect to bone marrow aspiration there was a significant difference in the quality of specimens obtained by medical and nursing staff, and this was due to the spreading of the aspirate. This is not surprising since the medical staff all had extensive experience and the nurses were newly trained. It is well known that satisfactory spreading of blood or bone marrow

films requires practice. This problem is lessening as the nurses become more experienced, and we anticipate that it will disappear altogether. Before the nurses had become competent at slide preparation, problems were easily overcome by placing a 2 ml sample of aspirated marrow in a specimen bottle containing EDTA so that smears could also be prepared by the medical or haematology laboratory staff. If the spread is done within eight hours this does not cause EDTA artefact, and we have not found dilution with peripheral blood to be a problem.

A nurse practitioner is always present on the day unit and therefore performance of procedures by them rather than by doctors, who are often performing tasks elsewhere in the hospital, has improved the efficiency of the unit and the quality of patient care, particularly with regard to reduced waiting times.

The training of nurse practitioners in the performance of bone marrow aspiration and trephine biopsy can be achieved easily if a suitable training programme is drawn up, medical and nursing staff are well motivated, and audit is performed to assess quality. A third member of the nursing staff is currently being trained. We recognise that the ability of individuals to obtain satisfactory specimens may vary⁴ and performance is kept under review.

At present some patients ask for the procedure to be performed by a doctor. We suspect this reflects the traditional view of the role of medical and nursing staff. With time this resistance to the extended role of nurses has been seen to lessen as the nurses gain confidence and the practice is seen to be the norm.

The audit also highlighted the inadequate length of some of the trephine biopsies obtained by both the nurses and the medical staff. An earlier study from Manchester⁴ has shown that trephine biopsies shrink by 25% during processing and that for the diagnosis of

neoplasia a minimum prefixation trephine length of 16 mm is required. By this standard only 40% of all the biopsies were adequate. Clearly this needs to be addressed and we now aim for a standard of 20 mm. The success of this policy will be reaudited shortly.

Some haematologists may feel that accurate reporting of bone marrow aspirates and trephines requires that they should personally perform the procedure as well as assess the patient clinically. This is probably ideal but in a busy unit it is not always practicable. Before the nurses adopted this role in our unit, bone marrows were often reported by doctors other than those who had performed the procedure. We feel that provided a good history, clinical examination, and a differential diagnosis are given to the reporting physician, interpretations are accurate and relevant.

The current service offered by nurse practitioners has improved the efficiency of our unit and we anticipate that the service will expand as more of the staff become competent in this procedure. A patient satisfaction survey established that the practice is acceptable to patients, and no patient who had had the test performed by a nurse would rather that it had been performed by a doctor.

With motivated medical and nursing staff and a structured educational and training programme, it is possible for a nurse practitioner to perform bone marrow aspiration and biopsy and obtain specimens of satisfactory quality, with subsequent improved efficiency of the unit and increased quality of patient care.

1 Junior Doctors Committee of the BMA. *Junior doctors: the new deal*. London: British Medical Association, 1991.

2 United Kingdom Central Council for Nursing, Midwifery and Health Visiting. *Scope of professional practice*. London: UKCC, 1992.

3 Milligan DW, Howard MR, Judd A. Lorazepam premedication before bone marrow biopsy. *J Clin Pathol* 1987; 40:696-8.

4 Bishop PW, McNally K, Harris M. Audit of bone marrow trephines. *J Clin Pathol* 1992;45:1105-8.



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J Clin Pathol 1999 52: 154-156

doi: [10.1136/jcp.52.2.154](https://doi.org/10.1136/jcp.52.2.154)

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