Pain and anxiety during bone marrow aspiration/biopsy: Comparison of ratings among patients versus health-care professionals

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Abstract

Purpose: To assess pain and anxiety during bone marrow aspiration/biopsy (BMA) among patients versus health-care professionals (HCPs).

Method: 235 adult hematologic patients undergoing BMA were included. BMA was performed by 16 physicians aided by nine registered nurses (RNs). Questionnaires were used to obtain patients and HCPs ratings of patients' pain and anxiety during BMA. Patterns of ratings for pain and anxiety among patients HCPs were estimated with proportions of agreement P(A), Cohen's kappa coefficient (κ), and single-measure intra-class correlation (ICC). We also explored if associations of ratings were influenced by age, sex, type and duration of BMA.

Results: The P(A) for occurrence of rated pain during BMA was 73% between patients and RNs, and 70% between patients and physicians, the corresponding κ was graded as fair (0.37 and 0.33). Agreement between patients and HCPs regarding intensity of pain was moderate (ICC = 0.44 and 0.42). Severe pain (VAS > 54) was identified by RNs and physicians in 34% and 35% of cases, respectively. Anxiety about BMA outcome and needle insertion was underestimated by HCPs. P(A) between patients and RNs and patients and physicians regarding anxiety ranged from 53% to 59%. The corresponding κ was slight to fair (0.10–0.21). ICC showed poor agreement between patients and HCPs regarding intensity of anxiety (0.13–0.36).

Conclusions: We found a better congruence between patients and HCPs in pain ratings than in anxiety ratings, where the agreement was low. RNs and physicians underestimated severe pain as well as anxiety about BMA outcome and needle insertion.

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Keywords

Bone marrow aspiration; Pain; Anxiety; Agreement; Health-care professionals; Patient

Introduction

Patients with cancer undergo several different and repeated diagnostic procedures during the disease trajectory. Pain caused by various procedures and situations is defined as procedural pain, i.e. an acute increase or sudden onset of pain with short duration (Heafield, 1999). Among the most painful procedures are those when instruments or devices are inserted into the body, usually by cutting or puncturing the skin (Coutaux et al., 2008). In a recent study, pain was evaluated in cancer patients undergoing different types of invasive examination. The highest pain levels were related to the procedures bone marrow aspiration/biopsy (BMA), lumbar puncture and insertion of central venous catheter (Portnow et al., 2003).

BMA is commonly performed in hematological patients to confirm diagnosis and to evaluate response to therapy. In adult patients, local infiltration anesthesia is routinely applied before BMA (Kuball et al., 2004). Previously, we conducted a prospective longitudinal study on procedure-related pain among adult hematologic patients who underwent BMA (Liden et al., 2009). Similar to prior studies (Dunlop et al., 1999; Vanhelleputte et al., 2003; Kuball et al., 2004; Steedman et al., 2006), we found BMA-related pain to be common: 70% of the patients reported pain during BMA and 35% reported severe-to-worst-possible pain (Liden et al., 2009).

Reasons for not preventing pain related to BMA may depend on health-care professionals' insufficient knowledge of procedural pain, or on inadequate pain analysis (Field, 1996; Drayer et al., 1999; Sjostrom et al., 1999; Puntillo et al., 2003). Another possible barrier to efficient pain treatment may be poor congruence of the ratings for pain among patients versus health-care professionals (Drayer et al., 1999). Health-care professionals' estimates of cancer patients' pain commonly diverge from the patients' own experience (Grossman et al., 1991; Sneeuw et al., 1999; Kuball et al., 2004; Budischewski et al., 2006). Health-care professionals seem to overestimate mild pain and underestimate severe pain (Grossman et al., 1991; Kuball et al., 2004; Budischewski et al., 2006). Anxiety often co-exists with and exacerbates the perception of pain (Ozalp et al., 2003). A poor correlation between cancer patients' and health-care professionals' assessments of anxiety is also reported (Badner et al., 1990; Heikkila et al., 1998; Martensson et al., 2008).

Although poor agreement between patients' and health-care professionals' ratings of cancer patients' pain and anxiety is recognized, to our knowledge, there is limited empirical research focusing on procedures. Procedures are often associated with considerable discomfort and pain (Portnow et al., 2003) why such knowledge would be of value for adequate symptom management. The aim of the present study was to assess ratings for pain and anxiety during BMA among patients versus health-care professionals. Also we explored whether patterns of ratings were influenced by the patients' age or sex, as well as the type and duration of BMA.

Methods and material

Subjects

Two hundred thirty-five (median age 62 years, range 20–89 years) of 263 (89.4%) consecutive adult patients scheduled for BMA at the outpatient clinic of the Division of Hematology, Karolinska University Hospital, were included (Table 1). Patients could only be enrolled once. Inclusion criteria were age 18 years or older and with a scheduled BMA. Exclusion criteria were mental disorders and linguistic difficulties, unwillingness to participate, not showing up on time for the BMA, sedative medication, or fainting before BMA. Informed consent was obtained from all patients prior to study enrollment. The study was approved by the Regional Ethics Committee in Stockholm.

The BMAs were performed by nine attending hematologists and seven hematology fellows (female $n = 10$, male $n = 6$). Twenty-six percent of the BMAs were performed by attending hematologists and 74% by hematology fellows. Seven out of nine attending hematologists and six out of seven hematology fellows had performed more than 100 BMAs previously. Nine RNs assisted the physicians during the BMAs. All the RNs were female with a median of four years (range 1–19 years) of professional experience.

Bone marrow aspiration/biopsy

As pain relief, a local anesthetic (Lidocaine 1% 10–20 ml) was given subcutaneously as well as with periostal infiltration. After local anesthesia, BMA was carried out using a 15 gauge × 2.7 inch aspiration needle and/or 11 gauge × 4 inch biopsy needle (Medical Device Technologies, Inc).

Data collection

Self-administered questionnaires were used to obtain information about pain and anxiety from the patients (Liden et al., 2009) and to assess physicians' and RNs impressions of patients' experience of pain and anxiety.

Questionnaires to patients

Prior to the BMA, the patients answered a study-specific questionnaire including questions concerning anxiety about BMA needle insertion and BMA outcome. First, the presence or absence of anxiety was recorded. Thereafter the intensity of anxiety was scored on Visual Analog Scales (VAS) ranging from 0 to 100 mm anchored 0 mm = no anxiety and 100 mm = worst possible anxiety. The participants were requested to mark the point on each line that best agreed with their experience of anxiety.

Ten minutes after the BMA, a second study-specific questionnaire about pain during the procedure was completed by the patients. First, presence or absences of pain was recorded. Then, the intensity of pain was scored on VAS with 0 mm = no pain and 100 mm = worst possible pain. Intensity > 30 mm on VAS was considered to represent moderate pain and VAS > 54 mm severe pain (Collins et al., 1997).

Questionnaires to physicians and registered nurses

The physicians performing the BMAs and the assisting RNs individually filled out a questionnaire immediately after completion of each BMA. They recorded their assessments of the patient's pain during the BMA, anxiety about the needle insertion and anxiety about the outcome (presence or absence and intensity on VAS), without knowing the patients' responses in the patient questionnaires. Using a standardized data-entry form, physicians and RNs also recorded their own gender, and the number of years working in hematology. Physicians also recorded the estimated number of BMAs they had carried out, as well as clinical information regarding the patient.

Statistics

Associations of ratings for occurrence of pain and anxiety during BMA among patients versus health-care professionals were assessed using proportions of agreement P(A) and Cohen's unweighted kappa coefficient (κ), correcting for the eventuality that agreement could occur by chance alone. In accord with Landis and Koch (1977), the magnitude of the κ values was graded as follows: κ 0 = poor; κ 0.01–0.20 = slight; 0.21–0.40 = fair; 0.41–0.60 = moderate; 0.61–0.80 = substantial; and 0.81–1.0 = almost perfect agreement. Using the McNemar test we tested for marginal homogeneity between ratings of occurrence of pain and anxiety among patients versus health-care professionals (McNemar, 1947; Maxwell, 1970). A significant value implies that the health-care professionals either under- or overestimated the patients rating. Agreement between the patients' and the health-care professionals' scoring of intensity of pain and anxiety by using VAS was evaluated with single-measure intra-class correlation (ICC) (Shrout and Fleiss, 1979). Based on the literature, ICC values were graded as follows: <0.4 = poor agreement; 0.4–0.74 = moderate agreement; 0.75–1 = good agreement (Shrout and Fleiss, 1979; Fleiss, 1986). We further explored associations of ratings for pain and anxiety during BMA among patients versus health-care professionals, by age of the patient (below/above 60 years), sex (female/male), type of BMA (bone marrow aspiration, bone marrow biopsy, or both), and duration of BMA (below/above 15 min). The level of all statistical tests was set at 0.05. The statistical calculations were done with the Stat View 5.0.1 and SPSS 14.0 software.

Results

Agreement of occurrence and intensity of pain, between patients and health-care professionals

The P(A) for rated occurrence of pain during BMA among patients versus RNs was 73%; and among patients versus physicians the P(A) was 70%. The corresponding κ-values were 0.37 and 0.33, respectively; these were both graded as fair (Table 2). For cases where the BMA took more than 15 min, the κ-value for the rated occurrence was graded as moderate (Table 2).

Agreement on rated intensity of pain was graded moderate between patients and RNs (ICC = 0.44) and patients and physicians (ICC = 0.42), respectively (Table 2). Agreement regarding rated intensity of pain was moderate among RNs and physicians for patients with an age of

60 years or younger, for male patients, when bone marrow biopsy was performed alone or together with aspiration, and when BMA took > 15 min (0.42–0.60) (Table 2).

Severe pain (VAS > 54) reported by patients was identified by RNs and physicians in 34% and 35% of cases, respectively (Figs. 1 and 2). Two patients scored worst possible pain, without being observed by an RN in one case or a physician in the other. Moderate pain (VAS >30 to 54) reported by patients was identified to 18% by RNs and 26% by physicians (Figs. 1 and 2). Mild pain (VAS 30) reported by patients was identified to 78% by RNs and 58% by physicians. Six RNs and ten physicians scored an intensity of pain (median VAS 16 (range 3–56), VAS 20 (range 3–69), respectively) in patients who did not report occurrence of pain.

Agreement between patients and health-care professionals on occurrence and intensity of anxiety for BMA outcome

The P(A)s for occurrence of anxiety for BMA outcome between patients and RNs and patients and physicians were 56% and 55%, respectively. The corresponding κ was graded as slight (0.19 and 0.14). κ appeared fair between patients and RNs when both biopsy and aspiration was performed and when BMA took more than 15 min (0.29 and 0.33) and between patient and physicians when bone marrow aspiration was performed (0.28). κ was slight for the remaining variables (0.02–0.17) (Table 3). RNs and physicians significantly ($p < 0.01$) underestimated anxiety about BMA outcome (Table 3).

The ICC showed poor agreement of rated intensity of anxiety for BMA outcome between patients and health-care professionals. ICC demonstrated moderate agreement among physicians and patients with an age of 60 years or younger (0.46). In all other analyzes regarding age, sex, type of BMA and BMA duration the ICC was in the poor range (−.01 to 0.38) (Table 3).

Agreement between patients and health-care professionals on occurrence and intensity of anxiety about needle insertion

The P(A)s between patients and RNs and patients and physicians for rated occurrence of anxiety about needle insertion were 53% and 59% respectively. The corresponding κ was graded as slight and fair. Between patients and RNs, κ appeared fair when both biopsy and aspiration were performed (0.23). Between patients and physicians, the following variables were fair; patients' age > 60 years, when bone marrow aspiration was performed, when bone marrow biopsy was performed, and when the BMA took more than 15 min (0.22–0.23). κ was slight for the remaining variables (Table 4). Health-care professionals significantly ($p < 0.001$) underestimated patients' anxiety regarding needle insertion (Table 4).

ICC demonstrated poor agreement between patients and health-care professionals regarding intensity of anxiety about needle insertion. ICC demonstrated moderate agreement between physicians and patients with an age >60 years, when both biopsy and aspiration were performed and when BMA took >15 min (0.41–0.50). In all other analyses regarding age, sex, type of BMA and BMA duration the ICC was in the poor range (0.10–0.40).

Discussion

Overall we found a discrepancy in ratings of occurrence of pain between patients and health-care professionals. Furthermore, our results showed low agreement on rated anxiety about the BMA outcome and needle insertion; and that both RNs and physicians underestimated patients' pain and anxiety. These finding are novel and of major importance because incongruence in ratings and in particular underestimation of patients' experience of pain and anxiety during BMA may lead to unnecessary suffering for patients.

In our study, the level of agreement for rated pain by patients and health-care professionals during BMA was graded as fair. In a prior study by Kuball et al. (2004) the level of agreement between patients and physicians was graded as moderate. We were unable to further assess underlying causes of these discrepancies and we have speculated that they may be due to differences in patient populations and/or health-care professionals. The rating for intensity of pain during BMA among patients versus health-care professionals was graded moderate. Importantly, in accord with the literature (Grossman et al., 1991; Harrison, 1991; Curtiss, 2001; Kuball et al., 2004), the occurrence of severe pain (>54 mm on VAS), present in 32% of the patients, was recognized by the RNs and physicians only in one third of the affected patients. Indeed, underestimation of severe pain, including procedural pain, appears to be common in a variety of patient care settings (Grossman et al., 1991; Harrison, 1991; Curtiss, 2001; Kuball et al., 2004). Prior studies have suggested that underestimation of severe pain could depend on RNs' and physicians' working experience, where those with longer experience have been found to underestimate the pain more frequently than do those with less experience (Choiniere et al., 1990; Marquie et al., 2003). As pointed out previously, a difference with regard to ratings of pain among patients and health-care professionals might depend on that the two groups relate to different experience when scoring pain (Gollop, 1986; Levin et al., 1998). For example, while the patient refers to his/her personal prior pain experience, a health-care professional relates both to his/her personal prior pain experience as well as the range of pain among prior patients (Gollop, 1986; Levin et al., 1998). We found better agreement for the rated occurrence of pain between patients and health-care professionals when, e.g., the BMA took more than 15 min, suggesting that staff might expect a longer BMA to be more painful since such BMAs may often be associated with procedure-related problems. Another proposed factor that influences the evaluation of rated pain among patients and health-care professionals is that health-care professionals sometimes believe some patients to exaggerate the severity of their pain (Drayer et al., 1999) while they sometimes believe that other patients act as they have to endure some pain (Idvall, 2002) and therefore ignore its intensity.

The diagnosis of cancer causes the patient anxiety and stress, which are due to the patients' perception of cancer, its manifestations, and treatment (Ozalp et al., 2003; Degen et al., 2010). Indications for BMA include the diagnosis, staging and therapeutic monitoring of the disease. Most patients with hematological malignancies must undergo repeated BMAs (Bain, 2001; Degen et al., 2010). Anxiety about the diagnostic outcome of the BMA increases the patients' experience of pain during BMA (Liden et al., 2009). To our knowledge, our study is the first systematic investigation of rated anxiety by BMA outcome conducted by patients, RNs and physicians. We found that patients expressed anxiety about

the BMA outcome more frequently and much more intensely than the RNs and physicians were able to identify. Previous studies on anxiety and depression in hospitalized patients with cancer have also reported poor-to-slight agreement between cancer patients' and staff's ratings of anxiety (Lampic et al., 1996). Some studies observe that staff tends to overestimate anxiety and emotional distress (Faller et al., 1995; Lampic et al., 1996; Heikkila et al., 1998; Lampic and Sjoden, 2000; Martensson et al., 2008) whilst others have found that this is not the case (Badner et al., 1990; von Essen, 2004). It has been suggested that poor skill in identifying patients' anxiety may be because staff lack the time to discern the patients' emotional distress; but also that patients do not express their anxiety (Radwin, 1996; Kruijver et al., 2006).

Regarding anxiety over needle insertion, we found poor-to-slight agreement between patient and health-care professionals. Both RNs and physicians strongly underestimated patients' anxiety here. In the literature, needle anxiety is well known among patients with diabetes, those undergoing dental procedures and those on intravenous chemotherapy (Hamilton, 1995; Mollema et al., 2001; Kettwich et al., 2007). Needle anxiety can be traced back to an adverse experience with needles in health-care. A bad experience can lead to a generalized, learned, negative response to different needle procedure (Marks, 1988). Most patients with blood cancer undergo intensive chemotherapy, venepunctures, lumbar punctures and repeated BMAs. Their attitude should be assessed, as the development of needle anxiety may cause delay or avoidance of appropriate medical care.

The main methodological strengths of the present study are the large sample size and the high response rate. Further, the physicians and RNs were blinded to the patients' ratings of pain and anxiety. However, one limitation is that we compared small staff samples with a larger patient sample. Differences between individual RNs and physicians such as personal characteristics may thus have influenced the results. On the other hand, the intention was to investigate the overall agreement between patients, RNs and physicians, not how individual RNs and physicians assess patients' pain and anxiety during BMA. Further, the timing when our questionnaires regarding anxiety were completed diverged between patients, RNs and physicians. Thus, all the patients answered the anxiety questions prior to the BMA while the staff responded to these items immediately after each. This could have influenced the congruence regarding anxiety. However, only this method of distributing the questionnaires was considered feasible, since the staff member's first meeting with the patient was in the consulting room where the BMA was performed.

The discrepancy between the patients' perception of pain and the health-care professionals' assessment can be a predictor of poor pain management (Curtiss, 2001). Pre-existing pain and anxiety about the diagnostic outcome of BMA or needle insertion have been found to be independent risk factors for increased pain experience during BMA (Liden et al., 2009). It is therefore of major interest to take account of the patient's self-assessment of pain and anxiety. Today, we know that procedure-related pain may have other consequences than patients' acute pain (Wincent et al., 2003). There is growing evidence that unrelieved acute pain can generate chronic pain (Kehlet et al., 2006), and pain perception can be intensified if accompanied by anxiety (Kain et al., 2000; Ozalp et al., 2003). Thus, it is urgent to develop

staff knowledge regarding pain and anxiety assessment, conduct analyzes and document patients' pain and anxiety related to BMAs.

In conclusion, we found a discrepancy between patients and health-care professionals ratings of occurrence and intensity of pain during BMA. In ratings of anxiety the agreement was even lower. A slightly better congruence between patients and health-care professionals was observed when the BMA included a biopsy or when the BMA took more than 15 min. Our results also show that both RNs and physicians underestimated severe pain reported by the patients. Moreover, the health-care professionals underestimated the anxiety for needle insertion and BMA outcome patients experienced. Results from this study emphasize the need for adequate symptom assessment. As pain and anxiety are subjective, patients' own reports are the most valid measures of the experience. They can easily be obtained by asking patients to quantify their pain and anxiety before and after undergoing a procedure.

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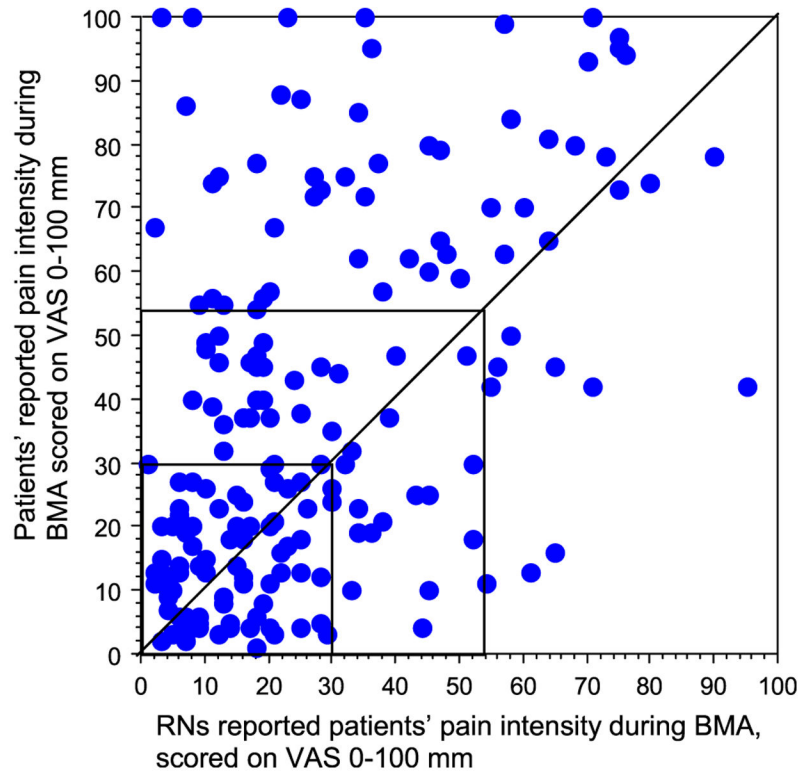
Fig. 1.
Intensity of pain during BMA. Data of 185 patients/185 RNs ratings who both reported that patient experienced pain during BMA. Intra-Class Correlation (ICC) 0.44 and 95% confidence interval (CI) 0.27–0.58.
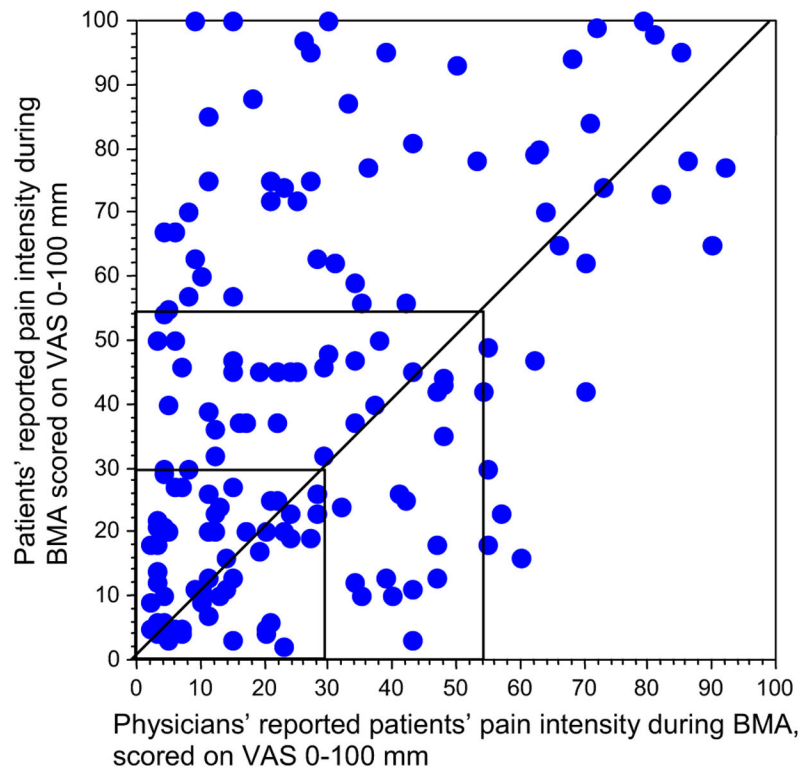
Fig. 2.
Intensity of pain during BMA. Data of 156 patients/156 physicians' ratings who both reported that patient experienced pain during BMA. Intra-Class Correlation (ICC) 0.42 and 95% confidence interval (CI) 0.23–0.56.

Table 1

Patients' characteristics.

Variable		
Total number, n (%)	235	(100)
Age, median years (range)	62	(20–89)
Sex, n (%)		
Female	109	(46)
Male	126	(54)
Underlying diagnosis according to BMA, n (%)		
Leukemia	34	(14)
Multiple myeloma	39	(17)
Lymphoma	46	(19)
Myelodysplastic syndrome	18	(8)
Chronic myeloproliferative disorder	31	(13)
Other hematologic disease	42	(18)
Non-hematologic disease	25	(11)
Previous BMA, n (%)		
No previous BMA	100	(43)
1–2 times	76	(32)
3–5 times	27	(11)
>5 times	32	(14)
Site of BMA, n (%)		
Posterior iliac crest	230	(98)
Sternum	5	(2)
Type of BMA, n (%)		
Bone marrow aspiration	67	(28)
Bone marrow biopsy	88	(37)
Both aspiration and biopsy	80	(35)

Table 2

Level of agreement for ratings of occurrence and intensity of pain between patients, registered nurses and physicians ($n = 235$).

Variable	n	P(A)[a]	Kappa[b]	McNemar[c]	VAS, n	Patient VAS, median (range)	Nurse/physician, median (range)	ICC[d]	95% CI
Pain during BMA									
Nurse, total	234	73%	0.37	0.614	185	30 (1–100)	20 (1–100)	0.44	(0.27–0.58)
Patients age									
60 years	108	78%	0.34	0.540	90	30 (2–100)	25 (3–100)	0.58	(0.41–0.71)
>60 years	126	69%	0.35	0.200	95	27 (1–100)	20 (3–100)	0.28	(0.07–0.46)
Sex									
Female	109	70%	0.10	0.296	88	36 (1–100)	22 (2–100)	0.39	(0.17–0.57)
Male	125	76%	0.46	0.855	97	27 (2–100)	19 (1–95)	0.50	(0.31–0.65)
Type of BMA									
Biopsy	88	73%	0.39	0.838	67	20 (3–100)	18 (2–95)	0.46	(0.25–0.63)
Aspiration	66	64%	0.16	0.540	52	38 (3–100)	20 (1–90)	0.26	(−.002 to 0.49)
Biopsy and aspiration	80	81%	0.51	0.606	66	31 (1–100)	25 (3–100)	0.58	(0.36–0.73)
BMA duration									
15 min	181	69%	0.31	0.350	41	25 (2–100)	18 (1–90)	0.40	(0.20–0.56)
>15 min	50	86%	0.55	0.453	142	45 (1–99)	36 (6–1009)	0.45	(0.18–0.66)
Pain during BMA									
Physician, total	234	70%	0.33	0.073	156	36 (2–100)	21 (2–100)	0.42	(0.23–0.56)
Age									
60 years	107	70%	0.25	0.216	78	37 (2–1009)	27 (2–100)	0.60	(0.41–0.73)
>60 years	127	70%	0.37	0.256	78	36 (3–100)	16 (2–92)	0.19	(0.19–0.38)
Sex									
Female	109	72%	0.35	0.012	74	40 (4–100)	22 (2–100)	0.35	(0.09–0.55)
Male	125	69%	0.32	0.873	82	28 (2–100)	20 (2–90)	0.50	(0.31–0.65)
Type of BMA									
Bone marrow biopsy	87	68%	0.31	0.850	55	25 (3–100)	20 (2–85)	0.52	(0.29–0.69)
Bone marrow aspiration	67	72%	0.37	0.359	45	43 (3–100)	15 (2–90)	0.16	(−.09 to 0.40)
Biopsy and aspiration	80	71%	0.32	0.095	56	37 (2–100)	26 (2–100)	0.50	(0.24–0.69)
BMA duration									

Variable	n	P(A)[a]	Kappa[b]	McNemar[c]	VAS, n	Patient VAS, median (range)	Nurse/physician, median (range)	ICC[d]	95% CI
15 min	182	68%	0.30	0.118	120	27 (3–100)	18 (2–90)	0.37	(0.17–0.53)
>15 min	50	78%	0.42	0.274	35	56 (2–99)	34 (4–100)	0.42	(0.19–0.65)

[a]Proportions of agreement P(A).

[b]Kappa, corrects for the eventuality that agreement could occur by chance alone.

[c]Test marginal homogeneity between ratings of occurrence of pain among patients versus health-care professionals.

[d]Agreement between the patients' and the health-care professionals' scoring of intensity of pain by using VAS was evaluated with single-measure intra-class correlation (ICC).

Table 3

Agreement on occurrence and intensity of anxiety about BMA outcome between patients and registered nurses and physicians ($n = 235$).

Variable	n	P(A)[a]	Kappa[b]	McNemar[c]	VAS, n	Patient VAS, median (range)	Nurse/physician, median (range)	ICC[d]	95% CI
Anxiety about BMA outcome									
Nurse, total	227	56%	0.19	0.009	147	50 (1–100)	18 (1–100)	0.13	(−0.03 to 0.28)
Age									
60 years	104	63%	0.09	0.045	80	54 (1–100)	22 (2–100)	0.22	(−.01 to 0.42)
>60 years	123	54%	0.08	0.111	67	37 (2–100)	15 (1–85)	−.01	(−.16 to 0.16)
Sex									
Female	108	58%	0.13	0.007	76	60 (2–1009)	18 (2–100)	0.08	(−.08 to 0.26)
Male	119	55%	0.10	0.341	71	34 (1–100)	20 (1–74)	0.09	(−.09 to 0.26)
Type of BMA									
Bone marrow biopsy	87	52%	0.02	0.165	57	48 (1–100)	18 (2–1009)	0.11	(−.10 to 0.33)
Bone marrow aspiration	64	53%	0.07	0.018	46	50 (3–100)	20 (1.87)	0.07	(−.11 to 0.28)
Both biopsy and aspiration	76	64%	0.29	0.700	44	51 (2–100)	18 (2–83)	0.22	(−.06 to 0.48)
BMA duration									
15 min	176	53%	0.06	0.020	113	50 (1–100)	18 (1–95)	0.12	(−.04 to 0.29)
>15 min	48	67%	0.33	0.453	32	46 (2–100)	22 (2–100)	0.14	(−.16 to 0.44)
Anxiety about BMA outcome									
Physician, total	234	55%	0.14	0.000	98	50 (1–100)	23 (2–100)	0.30	(0.06–0.50)
Age									
60 years	107	51%	0.05	0.001	59	50 (1–100)	26 (2–100)	0.46	(0.17–0.66)
>60 years	127	57%	0.16	0.0002	39	50 (2–100)	20 (3–85)	0.07	(−.14 to 0.31)
Sex									
Female	109	54%	0.11	0.000	51	63 (1–100)	27 (4–100)	0.18	(−.05 to 0.42)
Male	125	55%	0.12	0.002	47	34 (1–100)	18 (2–799)	0.36	(0.06–0.60)
Type of BMA									
Bone marrow biopsy	87	51%	0.05	0.006	37	49 (1–100)	21 (2–100)	0.27	(−.02 to 0.54)
Bone marrow aspiration	67	61%	0.28	0.000	31	60 (4–100)	26 (4–79)	0.38	(−.06 to 0.68)
Both biopsy and aspiration	80	54%	0.10	0.049	30	51 (2–100)	22 (3–100)	0.28	(−.04 to 0.56)
BMA duration									

Variable	n	P(A)[a]	Kappa[b]	McNemar[c]	VAS, n	Patient VAS, median (range)	Nurse/physician, median (range)	ICC[d]	95% CI
15 min	182	52%	0.12	0.000	73	52 (1–100)	21 (2–100)	0.32	(0.01–0.56)
>15 min	50	60%	0.17	0.500	25	45 (2–100)	35 (5–100)	0.24	(−.15 to 0.57)

[a]Proportions of agreement P(A).

[b]Kappa corrects for the eventuality that agreement could occur by chance alone.

[c]Test marginal homogeneity between ratings of occurrence of anxiety among patients versus health-care professionals.

[d]Agreement between the patients' and the health-care professionals' scoring of intensity of anxiety by using VAS was evaluated with single-measure intra-class correlation (ICC).

Table 4

Agreement on occurrence and intensity of anxiety about needle insertion between patient and registered nurse and physicians (*n* = 235).

Variable	*n*	P(A)[a]	Kappa[b]	McNemar[c]	VAS, *n*	Patient VAS, median (range)	Nurse/physician, median (range)	ICC[d]	95% CI
Anxiety about needle insertion									
Nurse, total	233	53%	0.10	0.0000	132	48 (1–100)	10 (1–100)	0.24	(–.05 to 0.47)
Age									
60 years	107	51%	0.10	0.0000	71	50 (1–100)	13 (1–100)	0.31	(–.06 to 0.59)
>60 years	126	55%	0.05	0.0002	61	44 (2–1009)	10 (1–83)	0.15	(–.07 to 0.36)
Sex									
Female	109	50%	0.07	0.0001	67	64 (1–100)	14 (1–100)	0.26	(–.06 to 0.53)
Male	124	56%	0.09	0.0006	65	44 (1–98)	9 (1–83)	0.11	(–.07 to 0.31)
Type of BMA									
Bone marrow biopsy	87	52%	0.06	0.0004	47	44 (1–100)	10 (1–78)	0.23	(–.07 to 0.50)
Bone marrow aspiration	66	44%	0.05	0.0000	45	50 (4–100)	9 (1–78)	0.20	(–.09 to 0.48)
Both biopsy and aspiration	80	62%	0.23	0.361	40	46 (1–1009)	14 (1–100)	0.30	(–.02 to 0.57)
BMA duration									
15 min	180	52%	0.06	0.000	97	47 (1–100)	9 (1–83)	0.19	(–.06 to 0.43)
>15 min	50	58%	0.20	0.029	33	64 (1–100)	16 (1–100)	0.29	(–.05 to 0.58)
Anxiety about needle insertion									
Physician total	234	59%	0.21	0.0000	81	50 (81–100)	17 (1–100)	0.36	(0.00–0.60)
Age									
60 year	107	54%	0.18	0.0000	43	61 (3–100)	17 (2–100)	0.31	(–.07 to 0.60)
>60 year	127	63%	0.23	0.0013	38	45 (1–100)	17 (1–100)	0.41	(0.06–0.66)
Sex									
Female	109	56%	0.18	0.0000	45	74 (3–100)	17 (1–100)	0.30	(–.05 to 0.58)
Male	125	62%	0.19	0.0000	36	40 (1–98)	17 (2–100)	0.38	(0.01–0.65)
Type of BMA									
Bone marrow biopsy	87	61%	0.24	0.004	25	64 (7–100)	23 (1–74)	0.10	(–.16 to 0.41)
Bone marrow aspiration	67	57%	0.22	0.0000	34	46 (1–100)	16 (3–71)	0.40	(–.08 to 0.71)
Both biopsy and aspiration	80	59%	0.14	0.082	22	75 (3–100)	15 (2–100)	0.50	(0.06–0.77)
BMA duration									

Variable	n	P(A)[a]	Kappa[b]	McNemar[c]	VAS, n	Patient VAS, median (range)	Nurse/physician, median (range)	ICC[d]	95% CI
15 min	182	58%	0.19	0.0000	57	47 (1–100)	13 (1–100)	0.31	(−.06 to 0.59)
>15 min	50	60%	0.23	0.0442	24	70 (4–100)	34 (3–100)	0.41	(0.03–0.69)

[a] Proportions of agreement P(A).

[b] Kappa corrects for the eventuality that agreement could occur by chance alone.

[c] Test marginal homogeneity between ratings of occurrence of anxiety among patients versus health-care professionals.

[d] Agreement between the patients' and the health-care professionals' scoring of intensity of anxiety by using VAS was evaluated with single-measure intra-class correlation (ICC).