

Patient and practitioner perspectives on postoperative pain control in Kumasi, Ghana

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Abstract

Objective: The treatment of pain has gained momentum in health care around the world. Nevertheless, pain is undertreated, particularly in the developing world. We sought to compare patient and healthcare practitioner perspectives of postoperative pain and assess perioperative analgesia utilisation in a tertiary care hospital in a resource-limited setting.

Design: We conducted a prospective observational study.

Setting and subjects: Postoperative patients and their respective recovery room nurses were studied at the Komfo Anokye Teaching Hospital in Kumasi, Ghana.

Outcome measures: Patients were surveyed 1-4 hours postoperatively. Pain severity on a numerical rating scale (NRS) and patient satisfaction with the pain control were assessed. Recovery room nurses who were responsible for administering the pain medications were surveyed on their perceptions of their patients' pain. Patient demographic information, diagnoses, surgery type, mode of anaesthesia and perioperative analgesia use were recorded.

Results: One hundred and four patients aged 42.1 years \pm 17.8 were interviewed over an eight-week period in 2010. Of the 104 patients, 58 (55.8%) underwent general anaesthesia and 39 (37.5%) spinal anaesthesia. Seventy-eight patients (75%) received intraoperative analgesia. Eighty-nine patients (86.5%) were prescribed postoperative analgesia. Only 27 (26%) had received any analgesia by the time they were surveyed. All postoperative analgesia was administered intramuscularly. Thirty-six patients (34.6%) rated their pain as severe (NRS 7-10). Overall, nurses perceived patients' pain to be lower than patients' own rating [a mean difference 1.26 units, 95% confidence interval (CI): 0.57-1.95, p-value < 0.001]. Patients were 2.77 times as likely to rate their pain as severe compared to nurses (relative risk: 2.77, 95% CI: 1.56-4.91).

Conclusion: There was significant discrepancy in the perception of pain between patients and healthcare providers. Simple pain assessment tools and the early institution of intravenous postoperative analgesia may improve postoperative pain assessment and treatment.

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Introduction

The treatment of pain has gained momentum in world health policy. In 2001, the Joint Commission on Accreditation of Healthcare Organizations instituted pain management standards that required evidence-based assessment and control of pain in all healthcare institutions in the USA.¹ In 2004, the European Federation of the International Association for the Study of Pain (IASP) and the World Health Organization (WHO) sponsored the Global Day Against Pain. These organisations hoped to gain wide acceptance that, in addition to overall health, explicit pain treatment would become a human right.²

For many years, there have been established protocols for the measurement and treatment of pain. For example, the USA Veterans' Health Administration devised a standardised protocol to assess acute pain that has been demonstrated to be effective.³ The WHO developed the Three-Step Analgesic Ladder for cancer pain and promoted the use of immediate-release morphine sulphate, a cost-effective, generic medication, for the treatment of moderate to severe pain.⁴ The WHO also cultivated guidelines for the prevention and treatment of postoperative pain.^{5,6}

Nevertheless, pain management is neglected, particularly in the developing world. In many countries, there is a

shortage of anaesthesiologists and other pain management specialists.^{7,8} Also, lack of awareness and education of healthcare professionals contributes to the undertreatment of pain, particularly in developing countries. A 2007 survey conducted by the IASP revealed that 91% of its members in developing countries believed that “lack of education was the main barrier to good pain management in their part of the world”, while 75% believed that “lack of government priorities for pain management was the second most common barrier to good treatment”.⁸ At the 2009 All Africa Anaesthesia Congress in Nairobi, Kenya, a call was made to healthcare institutions in developing countries to adopt standardised protocols for the assessment and treatment of pain.

Although postoperative pain has been studied in high-income countries,⁹ minimal research has been carried out in less developed countries, particularly in Africa. In Eldoret, Kenya, 57% of healthcare practitioners who work with patients in the perioperative period indicated that they lacked the knowledge to manage postoperative pain.¹⁰ Research in Nigeria demonstrated that postoperative pain was undertreated in patients who underwent a Caesarean section.¹¹ Postoperative pain was similarly undertreated following thoracic and abdominal surgery in Kenya.¹² As of yet, there are no published reports from Africa that have examined both patients’ and healthcare practitioners’ perspectives regarding postoperative pain.

Komfo Anokye Teaching Hospital (KATH) is one of two tertiary hospitals in Ghana. It serves as the major referral centre for the northern sector of the country. In accordance with the recommendations of the 2009 All Anaesthesia Congress, KATH plans to institute a standardised change of practice regarding postoperative pain management. In order to provide a foundation upon which to make evidence-based improvement, the current state of postoperative pain assessment and treatment at KATH was studied. The objective was to compare patient and healthcare practitioner perspectives on postoperative pain and its management, and to evaluate analgesic prescription practices among physicians.

Method

This was a prospective observational study of postoperative pain assessment and treatment at KATH in Kumasi, Ghana, over an eight-week period in 2010. Patients over the age of 12 years were eligible. KATH has many clusters of operating theatres: accident and emergency, the main theatre, obstetrics and gynaecology, and oral and maxillofacial surgery. Only patients who were operated on in the accident and emergency theatres or the main theatre were included. Nurses who cared for the participating patients in the postoperative period were also included in the study. Exclusion criteria for the patients were altered mental status at the time of survey, chronic pain conditions (pain > 48 hours) that were not addressed by the surgery (e.g. a patient who had an appendectomy, but also had chronic

back pain), and failure to obtain a completed survey from the corresponding nurse. The study was approved by the KATH Ethics Committee and the Children’s Hospital of Philadelphia Institutional Review Board. Written informed consent was obtained from all the subjects. Consent was obtained from the parent or guardian of patients under the age of 18. Assent was obtained from these patients.

Patients were examined 1-4 hours postoperatively. All patients were surveyed while in the postoperative recovery room. Obtained data included pain location, pain severity on a numerical rating scale (NRS), pain quality and patient satisfaction with the pain control. The NRS is a line marked in equal increments from 0-10, with zero representing no pain and 10 representing the worst imaginable pain. The NRS has been validated in patients who are eight years of age and older in many cultural contexts.¹³⁻¹⁵ Patient satisfaction was rated on a four-point Likert scale.

All patients were assessed by means of a verbal interview. Patients were also shown illustrated diagrams that depicted the NRS and a human body to locate pain for added clarification. If a patient was not comfortable completing the survey in English, it was verbally translated into the language of choice by one of two interpreters trained to administer the survey.

At the same time that a patient was surveyed, the patient’s recovery room nurse was also appraised regarding his or her perception of the patient’s pain location and severity and the nurse’s satisfaction with the patient’s pain control. The nurses’ survey was similar to that of the patients and consisted of a verbal interview with diagrams that depicted the NRS and a human body to describe the location of the pain. The recovery room nurses were interviewed because they were largely responsible for making the decision to administer medication to the patients in the postoperative period.

A chart review recorded demographic information, vital signs, diagnoses, type of surgery, anaesthesia modality and prescribed and dispensed perioperative analgesia. Surgical cases were classified as orthopaedic, abdominal, urological, plastic surgery (split-thickness skin grafts), gynaecological (total abdominal hysterectomy), neurological (laminectomy), thyroid and breast. Modes of anaesthesia were categorised as general, spinal, regional and local.

Statistical analysis was performed using the Stata® software package, version 11.1 (Stata Corp). Descriptive statistics were used to estimate the means, frequencies and standard deviations (SDs) of the study variables, including patients’ age, sex, type of surgery and mode of anaesthesia. Because the time of being surveyed postoperatively followed a nonnormal distribution, it was summarised using medians and quartiles, rather than means and SDs. The primary outcome was the mean difference between patients’ and nurses’ NRS scores, which was calculated using a paired Student’s t-test. It was estimated that with 90 patients, the study would have 80% power to detect a significant mean

difference between patients' and nurses' NRS scores with an effect size of 0.3. A Shapiro-Wilk test of the differences between paired patient and nurse NRS scores confirmed that the data were normal (p -value = 0.85). The correlation between patients' and nurses' NRS scores was assessed using a Spearman correlation coefficient. Linear regression was employed to determine whether age, sex, time of surgery, intraoperative analgesia or postoperative analgesia predicted patients' or nurses' NRS scores. Each potential predictor was tested independently and in combination using backward selection. Fischer's exact test assessed whether there was a difference in the proportion of patients who received intraoperative analgesia among patients who underwent different modes of anaesthesia. All reported p -values were two sided. A p -value of 0.05 or less indicated statistical significance.

Results

One hundred and six patients were enrolled between 1 March and 23 April, 2010. Two patients were excluded because their nurse was not available to complete the survey. Data from 104 patients were analysed.

Table I describes the patient characteristics. The mean age was 42.1 ± 17.8 years. 44.2% of patients were female. The median time of being surveyed was 100 minutes (65-150 minutes) postoperatively. The majority of the 104 patients underwent orthopaedic surgery ($n = 35$, 34.7%) and abdominal surgery ($n = 26$, 25%). Fourteen patients (13.5%) had urological surgery, 6 (5.8%) plastic surgery (split-thickness skin grafts), 10 (9.6%) gynaecological surgery (total abdominal hysterectomy), 6 (5.8%) neurological surgery (laminectomy), 2 (1.9%) thyroid surgery and 2 (1.9%) breast surgery. The most common modes of anaesthesia were general anaesthesia ($n = 58$, 55.8%) and spinal anaesthesia ($n = 39$, 37.5%). Four patients (3.9%) received regional anaesthesia, 2 (1.9%) local anaesthesia and 1 (1%) combined spinal and general anaesthesia.

Pain severity scores: patient and nurse ratings

Thirty-nine patients (37.5%) rated their pain as mild (NRS 0-3), 29 (27.9%) as moderate (NRS 4-6) and 36 (34.6%) as severe (NRS 7-10). Of the 58 patients who had general anaesthesia, most patients reported moderate or severe pain: 22 patients (37.9%) reported severe pain, 20 (34.5%) moderate pain and 16 (27.6%) mild pain. In contrast, most of the 39 patients who had spinal anaesthesia reported either mild postoperative pain ($n = 20$, 51.3%) or severe pain ($n = 13$, 33.3%). Relatively few reported moderate pain ($n = 6$, 15.4%) (Table II and Figure 1). The patients' self-reported pain severity did not significantly relate to the time that they were surveyed, age, sex or type of surgery.

Nurses rated 39 (37.5%) of the 104 patients' pain as mild (NRS 0-3), 52 (50%) as moderate (NRS 4-6) and 13 (12.5%) as severe (NRS 7-10). Of the 58 patients who underwent general anaesthesia, nurses rated 18 (31%) to have mild pain, 32 (55.2%) to have moderate pain and eight (13.8%)

Table I: Baseline characteristics

Number of patients	104
Age (years) ¹	42.1 \pm 17.8
Female sex	46 (44.2)
Time postoperatively of survey (minutes) ²	100 (65-150)
Type of surgery	
Orthopaedic	35 (34.7)
Abdominal	26 (25)
Urological	14 (13.5)
Gynaecological	10 (9.6)
Plastic surgery (split-thickness skin graft)	6 (5.8)
Neurological (laminectomy)	6 (5.8)
Thyroid	2 (1.9)
Breast	2 (1.9)
Other	3 (2.9)
Anaesthesia modality	
General	58 (55.8)
Spinal	29 (37.5)
Combined spinal and general	1 (1)
Regional	4 (3.9)
Local	2 (1.9)

Data given as n (%) unless otherwise indicated.
Plus-minus values are means \pm standard deviation.
Data given as median (interquartile range).

to have severe pain. Of the 39 patients who had general anaesthesia, nurses rated 17 (43.6%) to have mild pain, 18 (46.2%) to have moderate pain and four (10.3%) to have severe pain (Table III). The nurses' rating of patients' pain severity did not significantly relate to the time that nurses were surveyed or to patients' age, sex or type of surgery.

Patients were 2.77 times more likely to rate their pain as severe (7-10 on the NRS) compared to nurses [relative risk (RR) = 2.77, 95% confidence interval (CI): 1.56-4.91]. Overall, nurses perceived patients' pain to be lower than patients' own rating. Analysis of the pairs of patient and nurse NRS scores revealed that nurses' ratings were an average of 1.26 units lower on the NRS compared to patients' ratings (95% CI: 0.57-1.95, p -value < 0.001) (Table IV). In addition, the correlation between patients' and nurses' NRS scores was poor (Spearman correlation coefficient: 0.43, p -value < 0.001), indicating that although nurses usually underestimated patients' pain, there were instances in which patients rated their own pain as mild to moderate when nurses perceived a higher severity (Figure 2).

Satisfaction with pain control

Although patients responded with varying pain severity scores, 84 (80.7%) were satisfied with the pain treatment that they had been given. Of the 36 patients who reported severe pain (NRS 7-10), 27 (75%) were satisfied with the pain management by the healthcare team. In addition, 100% of nurses were satisfied with the management of their patients' pain.

Table II: Patients' postoperative pain severity on the numerical rating scale by anaesthesia modality

Anaesthesia modality	Mild (NRS 0-3)	Moderate (NRS 4-6)	Severe (NRS 7-10)
All patients (n = 104)	39 (37.5)	29 (27.9)	36 (34.6)
General anaesthesia (n = 58)	16 (27.6)	20 (34.5)	22 (37.9)
Spinal anaesthesia (n = 39)	20 (51.3)	6 (15.4)	13 (33.3)
Combined spinal and general anaesthesia (n = 1)	0 (0)	1 (100)	0 (0)
Regional anaesthesia (n = 4)	0 (0)	1 (50)	1 (50)
Local anaesthesia (n = 2)	3 (75)	1 (25)	0 (0)

Data given as n (%).
NRS: numerical rating scale

Table III: Nurses' ratings of patients' postoperative pain severity on the numerical rating scale according to anaesthesia modality

Anaesthesia modality	Mild (NRS 0-3)	Moderate (NRS 4-6)	Severe (NRS 7-10)
All patients (n = 104)	39 (37.5)	52 (50)	13 (12.5)
General anaesthesia (n = 58)	18 (31)	32 (55.2)	8 (13.8)
Spinal anaesthesia (n = 39)	17 (43.6)	18 (46.2)	4 (10.3)
Combined spinal and general anaesthesia (n = 1)	1 (100)	0 (0)	0 (0)
Regional anaesthesia (n = 4)	0 (0)	1 (50)	1 (50)
Local anaesthesia (n = 2)	3 (75)	1 (25)	0 (0)

Data given as n (%).
NRS: numerical rating scale

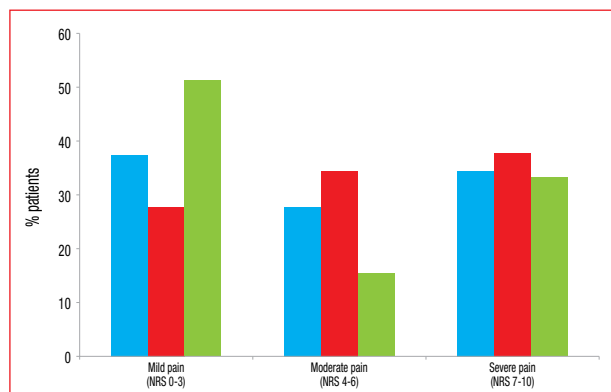


Figure 1: Patients' postoperative pain severity according to anaesthesia modality

Pain was scored on the numerical rating scale (NRS) with zero representing no pain and 10 representing the most severe pain. Of all the patients (■), 39 (37.5%) rated their pain as mild (NRS 0-3), 29 (27.9%) as moderate (NRS 4-6) and 36 (34.6%) as severe (NRS 7-10). Of the 58 patients who had general anaesthesia (■), most patients reported moderate or severe pain, with 22 patients (37.9%) reporting severe pain, 20 (34.5%) moderate pain, and 16 (27.6%) mild pain. In contrast, most of the 39 patients who had spinal anaesthesia (■) reported either mild postoperative pain (n = 20, 51.3%) or severe pain (n = 13, 33.3%). Relatively few reported moderate pain (n = 6, 15.4%).

NRS: numerical rating scale

Prescription practices

Twenty-nine patients (27.8%) received preoperative sedation with midazolam. Intraoperative analgesia was administered to 78 patients (75%). Many patients (n = 38, 37.3%) received meperidine. Fifteen patients (14.7%) received diclofenac, 17 (16.7%) morphine, 17 (16.7%) fentanyl, 13 (12.8%) ketorolac, and nine (8.8%) metamizole (Analgin®). Fifty-seven of the 59 patients (98.2%) who underwent general anaesthesia received intraoperative analgesia compared to 19 of the 39 patients (48.7%) who underwent spinal anaesthesia (p-value < 0.001, Fischer's exact test) (see Table V).

Most patients (n = 89, 86.5%) were prescribed postoperative pain medication, 59 (56.6%) meperidine, 78 (76.8%)

Table IV: Bivariate analysis of patient and nurse pain numerical rating scale scores

Patient NRS	5.08 ± 3.89
Nurse NRS	3.78 ± 2.63
Mean difference between patient and nurse NRS scores (95% CI)	1.26 (0.57-1.95)
p-value ³	< 0.001

Plus-minus values are means ± standard deviation
p-value calculated using paired Student's t-test
CI: confidence interval, NRS: numerical rating scale

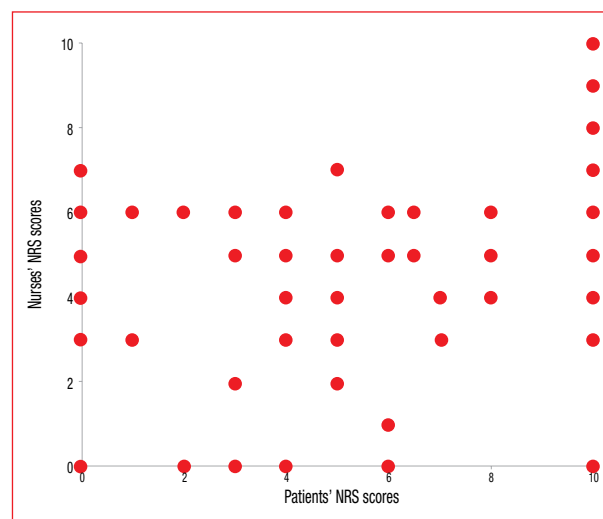


Figure 2: Patients' vs. nurses' numerical rating scale scores (matched)

When the patients' numerical rating scale (NRS) scores were matched with the corresponding nurses' NRS scores, the correlation was poor (Spearman correlation coefficient: 0.43, p-value < 0.001).

NRS: numerical rating scale

diclofenac, 5 (4.8%) tramadol, 5 (4.8%) acetaminophen and 1 (1%) morphine. However, only 27 (26%) of the 104 patients received any postoperative analgesia at the time of being surveyed. Ten (9.6%) patients received meperidine,

Table V: Intraoperative analgesia according to the anaesthesia modality

Anaesthesia modality	All patients (n = 104)	General anaesthesia (n = 58)	Spinal anaesthesia (n = 39)
Any analgesic	78 (75)	57 (98.2)	19 (48.7)
Meperidine	38 (37.3)	23 (40.3)	14 (36.8)
Diclofenac	15 (14.7)	13 (22.8)	2 (5.3)
Morphine	17 (16.7)	15 (26.3)	1 (2.6)
Fentanyl	17 (16.7)	17 (29.8)	0 (0)
Ketorolac	13 (12.8)	10 (17.5)	3 (7.9)
Metamizole (Analgin®)	9 (8.8)	8 (14.4)	1 (2.6)

Data given as n (%).

10 (9.6%) diclofenac, 1 (1%) morphine, 2 (2%) tramadol and 1 (1%) acetaminophen (Table VI). All postoperative analgesia was given intramuscularly. This was despite the fact that patients had functioning intravenous lines that were accessed during their recent surgeries. There was no significant change in patients' NRS scores if they were given intraoperative analgesia (a change in mean NRS score = 1.09, 95% CI: -0.65-2.83, p-value = 0.218). Also, there was no change in patients' NRS scores if they were given postoperative analgesia (a change in mean NRS score = 0.485, 95% CI: -1.24-2.21, p-value = 0.58).

Table VI: Postoperative analgesia prescription patterns

Anaesthesia modality	Patients prescribed an analgesic	Patients given an analgesic
Any analgesia	89 (86.5)	27 (26)
Meperidine	59 (56.6)	10 (9.6)
Diclofenac	78 (76.8)	10 (9.6)
Tramadol	5 (4.8)	2 (2)
Acetaminophen	5 (4.8)	1 (1)
Morphine	1 (1)	1 (1)

Data given as n (%).

Discussion

There was significant discrepancy in the perception of pain between patients and healthcare providers. This may reflect poor communication. Usually, patients perceived their pain to be greater than the nurses' perception of their pain. In addition, there was a poor correlation between patients' and nurses' pain rating. Generally, although nurses underestimated patients' pain, there were instances when they overestimated it as well. Communication is crucial,³ particularly in a resource-limited setting in which patient-controlled analgesia is not available. The data demonstrate that although the patients' pain was not well controlled, they were still satisfied with the pain management. This may be cultural as patients may feel that some pain is an acceptable part of postoperative recovery. Actively seeking to determine patients' pain levels may be particularly important in Ghana and other settings where it is the cultural norm for patients to silently bear pain and to not disturb healthcare practitioners. Regular use of simple pain

assessment tools, such as the NRS, to determine patients' pain levels may be a simple first step.¹²

Early institution of postoperative analgesia is another potential area of improvement. Only 26% of patients had received postoperative analgesics at the time of being surveyed, although 62% reported moderate to severe pain. Proactive communication with patients to assess and promptly treat their pain is essential for effective pain control.^{3,4,16,17}

Protocols could be developed for specific subpopulations.^{3,16} A large percentage of surgery at KATH is carried out under spinal anaesthesia, partially due to clinician preference and the relative scarcity of inhalational agents. In general, patients are comfortable in the immediate postoperative period. However, once the spinal anaesthesia has worn off, patients experience severe pain. The data illustrate this phenomenon. Most patients who received spinal anaesthesia experienced either mild (51%) or severe (33%) postoperative pain. Very few experienced moderate pain (15%). Since the length of action of spinal anaesthesia is relatively predictable, postoperative analgesia should be administered in a timely manner in anticipation of the spinal anaesthetics wearing off.¹⁶

Greater education of physicians and nurses should encourage the use of morphine over meperidine and discourage the intramuscular route of drug administration. The WHO recommends morphine for the relief of moderate to severe pain.^{4,5} However, in this study patients were mostly given meperidine or diclofenac. The use of meperidine is discouraged in many guidelines because of its toxic metabolite, normeperidine, and the unpredictable response of patients to the drug.^{3,17,18} Intramuscular administration of postoperative analgesic medication contributes to unpredictable efficacy.^{3,17} This may explain the lack of correlation between patients' NRS scores and the received analgesia. Also, patients who received postoperative analgesia may have been in greater pain prior to asking for and receiving medication due to a delay in initiation of the pain treatment.

Improving health care can be challenging in resource-limited settings and economic considerations may influence KATH's prescription patterns. Anaesthesia resources have

been surveyed in African countries ranging from Zambia to Uganda and have been found to be less than adequate.^{7,19} There is also a need to increase the availability of pain medications in Africa.²⁰⁻²² However, unlike other African countries,²⁰⁻²² Ghana does not have an overly restrictive policy on opioids. KATH has morphine and meperidine on its formulary. Meperidine is manufactured in Ghana and therefore KATH is almost always guaranteed a supply. It is possible that if demand for morphine increased among Ghana's prescribing clinicians, Ghanaian drug companies might be encouraged to manufacture morphine as well, thus increasing the supply and decreasing the price within the country.

The strength of this study was that it was a prospective study. In addition, since pain can vary greatly from moment to moment, great care was taken to interview patients and nurses at the same time. Considerable care was also taken to train interpreters and use the same interpreters consistently in order to limit the variation in survey responses because of faulty translation. This study reiterated that the NRS for pain severity can be used in many cultural contexts.^{12,14,15,17} Time was devoted specifically to explaining the NRS to participants. After a proper explanation was given, both healthcare practitioners and patients were able to understand and use the NRS.

A limitation of the study was that it was a single-centre study. KATH is a tertiary care hospital in Ghana and has more resources than many of the country's district hospitals. However, because it has the same or more resources than surrounding hospitals, one may assume that deficiencies that were found at KATH would also be found in other hospitals in the region. Therefore, the recommendations for improvement would be generalisable to other hospitals in resource-limited settings. Another limitation was that this was a cross-sectional observational study and there was no intervention with which to compare it. It would be ideal to compare the results of this study with postoperative pain data gathered after KATH's standardised pain protocol is implemented and for pain treatment to be measured over time in future studies. In addition, since patients and healthcare practitioners were not blinded to the purpose of the study, their answers may have been affected. However, similar results have occurred in comparable studies that have been conducted elsewhere in the world.^{9,23,24} Finally, the dosages of drugs were not examined. The study was conducted under the assumption that the standard doses that were given at KATH were the appropriate doses with which to treat the patients' pain.

Postoperative pain is a predictable occurrence and should be anticipated and prevented. Communication with patients and the use of pain assessment tools is crucial. The attenuation of intraoperative analgesia should be anticipated and evidence-based and generic medications, such as intravenous morphine, should be used early and often. The above recommendations are simple, cost-effective measures that can be applied to many low-resource settings.

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References

- Phillips DM. JCAHO pain management standards are unveiled. Joint Commission on Accreditation of Healthcare Organizations. *JAMA*. 2000;284(4):428-429.
- Brennan F, Carr DB, Cousins M. Pain management: a fundamental human right. *Anesth Analg*. 2007;105(1):205-221.
- Rosenquist RW, Rosenberg J, United States Veterans Administration. Postoperative pain guidelines. *Reg Anesth Pain Med*. 2003;28(4):279-288.
- World Health Organization. Cancer pain relief: with a guide to opioid availability. 2nd ed. Geneva: World Health Organization; 1996.
- World Health Organization. Surgical care at the district hospital. Geneva: World Health Organization; 2003.
- Kumar N. WHO normative guidelines on pain management: report of a Delphi study to determine the need for guidelines and to identify the number and topics of guidelines that should be developed by the WHO. Geneva: World Health Organization; 2007.
- Jochberger S, Ismailova F, Lederer W, et al. Anesthesia and its allied disciplines in the developing world: a nationwide survey of the republic of Zambia. *Anesth Analg*. 2008;106(3):942-948.
- Bond M, Mourin MA, Barros N, et al. Education and training for pain management in developing countries: a report by the IASP developing countries task force. International Association for the Study of Pain; 2007.
- Apfelbaum JL, Chen C, Mehta SS, Gan TJ. Postoperative pain experience: results from a national survey suggest postoperative pain continues to be undermanaged. *Anesth Analg*. 2003;97(2):534-540.
- Kituyi WP, Imbaya KK, Wambani JO, et al. Postoperative pain management: clinicians' knowledge and practices on assessment and measurement at Moi Teaching and Referral Hospital. *East Cent Afr Surg*. 2011;16(2):20-24.
- Kolavole IK, Fawole AA. Postoperative pain management following caesarian section in University of Ilorin Teaching Hospital (UIH), Ilorin, Nigeria. *West Afr J Med*. 2003;22(4):304-309.
- Ocitti EF, Adwok JA. Post-operative management of pain following major abdominal and thoracic operations. *East Afr Med J*. 2000;77(6):299-302.
- Williamson A, Hoggart B. Pain: a review of three commonly used pain rating scales. *J Clin Nurs*. 2005;14(7):798-804.
- Jelsma JM, Machiri G, Madzivire DM. The use of pain measurement scales in the Zimbabwean context. *Cent Afr J Med*. 1997;43(9):256-259.
- Von Baeyer CL, Spagrud LJ, McCormick JC, et al. Three new datasets supporting use of the numerical rating scale (NRS-11) for children's self-reports of pain intensity. *Pain*. 2009;143(3):223-227.
- American Society of Anesthesiologists Task Force on Acute Pain Management. Practice guidelines for acute pain management in the perioperative setting: an updated report by the American Society of Anesthesiologists Task Force on Acute Pain Management. *Anesthesiology*. 2004;100(6):1581.
- Carns P. ICSI health care guideline: assessment and management of acute pain. 6th ed. Bloomington, MN: Institute of Clinical Systems Improvement; 2008.
- Latta KS, Ginsberg B, Barkin RL. Meperidine: a critical review. *Am J Ther*. 2002;9(1):53-68.
- Hodges SC, Mijumbi C, Okello M, et al. Anaesthesia services in developing countries: defining the problems. *Anaesthesia*. 2007;62(1):4-11.
- Harding R, Powell RA, Kiyange F, et al. Provision of pain- and symptom-relieving drugs for HIV/AIDS in sub-Saharan Africa. *J Pain Symptom Manage*. 2010;40(3):4015-415.
- Powell RA, Kaye RM, Ddungu H, Mwangi-Powell F. Advancing drug availability-experiences from Africa. *J Pain Symptom Manage*. 2010;40(1):9-12.
- Human Rights Watch. Global state of pain treatment: access to palliative care as a human right. New York: Human Rights Watch; 2011.
- Guru V, Dubinsky I. The patient vs. caregiver perception of acute pain in the emergency department. *J Emerg Med*. 2000;18(1):7-12.
- Todd KH, Ducharme J, Choiniere M, et al. Pain in the emergency department: results of the pain and emergency medicine initiative (PEMI) multicenter study. *J Pain*. 2007;8(6):460-466.