

Barriers to adequate analgesia in paediatric burns patients

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Background. All children with burn injuries experience pain at some time during their management and recovery. Burn pain is challenging to manage, owing to a combination of factors. The process of achieving adequate analgesia involves the correct scripting of medication based on the doctor's knowledge, the correct fulfilling of that script, and patient compliance.

Objectives. To assess two components of this process, correct scripting of medication based on the doctor's knowledge and the correct filling of that script, to highlight potential barriers to adequate analgesia for burn-injured patients being followed up at an outpatient department. Patient compliance was out of the scope of this study.

Methods. The study was conducted in the Pietermaritzburg Burn Service (PBS) in Pietermaritzburg, South Africa, and was undertaken in two parts. The first part was conducted through an anonymous, voluntary questionnaire completed by doctors working in hospitals referring to the PBS. The aim of the questionnaire was to identify deficits in knowledge of doctors regarding background analgesia for burn-injured children. The second part was conducted through an audit of the outpatient folders of children attending the PBS outpatient clinic to identify discrepancies between analgesia prescribed and analgesia supplied to the patient.

Results. Thirty-six doctors completed the questionnaire. While nearly all the doctors prescribed background analgesia, just over half (58%) prescribed paracetamol, and of those, only half prescribed the correct dose. Half of the doctors prescribed tilidine, and only half of them knew the correct dose. Forty-seven percent of the doctors prescribed both paracetamol and tilidine for background analgesia. The outpatient folders of 59 children attending the outpatient clinic were audited. Fifty-three patients were prescribed paracetamol. There was a statistically significant difference between the paracetamol volume prescribed and the volume supplied ($p < 0.0001$). Twenty-four patients were prescribed ibuprofen. There was a statistically significant difference between the ibuprofen volume prescribed and the volume supplied ($p < 0.0001$).

Conclusions. Burn-injured children commonly receive inadequate analgesia in our setting. The reasons for this are multifactorial. The correct dose and the correct drugs for burn-related background pain are deficits in the knowledge of doctors who deal with this common problem. Furthermore, even if the correct drug and dose are prescribed, the correct volume of medication is often not issued by the pharmacy. This study highlights barriers to achieving adequate analgesia in children with burns being managed as outpatients. Potential strategies to overcome barriers include improving education with regard to pain management and burns at an undergraduate and postgraduate level, and improved supply chain management.

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The most frequent complaint of burn-injured patients is pain.^[1] All children with burn injuries will experience pain at some time during the course of their management and recovery. Burn pain is exceptionally challenging to manage^[2] owing to a combination of factors, including burn injury-related factors, healthcare practitioner-related factors and system-related factors.^[3,4] The burn injury-related factors influencing pain management encompass the dynamic nature of burn pain, which requires ongoing reassessment of the pain and adjustments in the analgesia regimen, altered metabolism of analgesics due to the hypermetabolic response, and the complex interaction between pain and anxiety that is inevitable in burn-injured patients.^[5,6]

The Pietermaritzburg Burn Service (PBS) prescribes analgesia according to the PBS burns protocols (Appendix A, <http://samj.org.za/public/sup/14519.pdf>). These protocols are also provided to the hospitals that refer to the PBS. It has previously been shown that in the referring hospitals there is a lack of knowledge regarding procedural analgesia and variable penetrance of analgesia protocols in the management of patients with burn injuries.^[7] We believe that this also translates into a lack of knowledge regarding background analgesia (pain relief aimed at constant burn-related pain, not

associated with procedures). This lack of knowledge combined with a common misconception of healthcare practitioners that burn wounds 'are just painful' leads to inadequate pain control for burn patients.^[8]

It is our impression that another factor contributing to inadequate pain control in patients being followed up in the outpatient department is that they are not being supplied with enough medication to last until their next follow-up visit. Consequently, their medication is depleted before their next appointment. As a result, it is difficult to break the cycle of pain, which can lead to the development of complex pain syndromes.^[9] Various system-related factors contribute to this inadequate supply of medication: stock-outs of drugs, budgetary constraints, lack of resources, and possibly lack of knowledge, on the part of the pharmacists issuing the medication, of the complexity of burn pain and how imperative adequate pain control is in the healing and overall wellbeing of these patients.^[4,10]

Objectives

The process of achieving adequate analgesia involves the correct scripting of medication based on the doctor's knowledge, the correct fulfilling of that script, and patient compliance. The objective of this

study was to assess two of these components: correct scripting of medication based on the doctor's knowledge and the correct filling of that script, to highlight potential barriers to adequate analgesia for burn-injured patients being followed up at an outpatient department. Patient compliance was out of the scope of this study.

Methods

The PBS operates across the regional (Edendale Hospital) and tertiary (Grey's Hospital) hospitals in Pietermaritzburg, KwaZulu-Natal (KZN). There are 40 dedicated burns beds across the metropolitan area, and these are managed by two burns surgeons. Ten of these beds are at Grey's Hospital and 30, including 6 high-care beds, are at Edendale Hospital. The PBS provides support to 19 district hospitals in the western third of KZN. The annual patient load consists of ~500 patients exclusively managed as outpatients and a further ~500 - 600 who are managed as inpatients. Patients in western KZN are managed according to the PBS burns protocols, with the aim being that all burns patients are discussed with or seen by one of the two burns surgeons.

The study was conducted in two parts: (i) to identify deficits in the knowledge of doctors regarding background analgesia for burn-injured children; and (ii) to identify whether patients are being given an inadequate supply of analgesia (a discrepancy between what is prescribed and what is supplied), resulting in their medication running out before their next appointment.

The first part of the study was conducted through an anonymous, voluntary questionnaire completed by medical officers and registrars working in the PBS as well as doctors encountered on outreach visits to the hospitals that refer to the PBS. Completion of the questionnaires occurred over a 6-month period from December 2018 to May 2019. The questionnaire included questions thought to be relevant to testing knowledge of background analgesia for burn-injured children being managed as inpatients. Demographic information, including the level of the hospital where the respondent worked and number

of years' experience working as a doctor, was collected. Evaluation of prescribing practices for background analgesia included questions on which drugs were used, as well as dosages and frequency at which the drugs were prescribed for inpatient administration. Data were collected on an Excel spreadsheet, version 16.40 (Microsoft, USA).

The second part of the study was conducted through an audit of the outpatient folders of children attending the burns clinic in the surgical outpatient department for a 2-month period, January and February 2019. Information regarding the dosage and frequency of analgesia, duration of the prescription for analgesia, and volume of the analgesia medication supplied was collected on an Excel spreadsheet. This information was used to calculate the volume of medication that the patient had been prescribed and the difference between the volume prescribed and the volume supplied to the patient.

Statistical analysis was performed by the authors using R Studio version 1.1.463 (R Foundation for Statistical Computing, Austria). A Wilcoxon signed-rank test was conducted to compare the supplied v. prescribed doses for each drug.

The study was granted ethical clearance by the Biomedical Research and Ethics Committee of the University of KwaZulu-Natal (ref. no. BE594/18).

Results

The anonymous questionnaire was completed by 36 doctors working at district, regional and tertiary hospitals across western KZN. Table 1 summarises the results of the questionnaire. While the vast majority of doctors (94%) prescribed background analgesia, just over half of them prescribed paracetamol and less than half prescribed the correct dose. Half of the doctors prescribed tilidine, and again only half of them knew the correct dose. Forty-seven percent of the doctors prescribed both paracetamol and tilidine for background analgesia.

The audit of the outpatient folders of children attending the burns clinic in the surgical outpatient department included 59 visits where

Table 1. Questionnaire results

Respondents	
Responded to questionnaire, <i>N</i>	36/36 (100% response rate)
Level of hospital, <i>n</i>	
District	18
Regional	9
Tertiary	9
Designation, <i>n</i>	
Medical officer	30
Registrar	6
Years qualified, mean (SD)	8.7 (6.2)
Background analgesia, <i>n/N</i> (%)	
Background analgesia prescribed	35/36 (94)
Paracetamol	
Prescribed	21/36 (58)
Correct dose prescribed	10/21 (48)
Tilidine	
Prescribed	18/36 (50)
Correct dose prescribed	9/18 (50)
Participants who prescribed both paracetamol and tilidine	17/36 (47)
Participants who claimed to prescribe background analgesia and used other drugs	2/36 (6)
Participants who claimed to prescribe background analgesia and did not indicate which drugs or doses	9/36 (25)

SD = standard deviation.

analgesia had been prescribed. The demographics of the children whose files were audited are summarised in Table 2. Further details of the analgesia prescribed and supplied are provided in Table 3.

Paracetamol was prescribed to 53 patients. The duration of the scripts ranged from 7 to 28 days. The mean (standard deviation (SD)) volume of paracetamol syrup prescribed was 471 (383.2) mL, and the mean (SD) volume supplied to the patient was 129 (87.5) mL. A Wilcoxon signed-rank test showed a statistically significant difference between the paracetamol prescribed and the paracetamol supplied by the pharmacy ($p < 0.0001$). Fig. 1 depicts the relationship between the paracetamol prescribed and that supplied to the patients.

Ibuprofen was prescribed to 24 patients. All these patients were also prescribed paracetamol. The duration of these prescriptions also ranged from 7 to 28 days. A Wilcoxon signed-rank test showed a statistically significant difference between the ibuprofen volume prescribed and the volume supplied ($p < 0.0001$). The mean (SD) ibuprofen volume prescribed was 335.6 (342.7) mL and the mean volume supplied was 110.1 (62.9) mL.

Discussion

The controversy surrounding provision of adequate analgesia is not a new one. An anonymous editorial advocating the formation of analgesia-providing teams was published as long ago as 1972.^[11] Despite the availability of effective analgesics, an unacceptable number of patients continue to experience intense pain.^[12] The provision of adequate analgesia, not only for burn-injured children but for all patients in pain, is dependent on various factors. In the case

of children, poor objective pain assessment, poor communication between the child, the parents and the hospital staff, and inexperience of both those prescribing analgesia and those administering it, are a few of these.^[13]

In our setting, factors contributing to inadequate analgesia can be divided into healthcare practitioner-related factors and system-related factors, and in burns, burn-related factors.

Our study, which demonstrated that approximately half the doctors who responded adhered to analgesia protocols and approximately half of those knew the correct drug dosages, is in keeping with other literature regarding healthcare practitioner-related factors that may contribute to inadequate analgesia.^[3,14,15] These factors include lack of training with regard to recognition of inadequate analgesia as well as lack of knowledge of the treatment modalities available.^[14] Historically, a low educational emphasis has been placed on pain management in both undergraduate and postgraduate medical training.^[14] Burns patients are at a further disadvantage, as there is an even greater deficit in burns training in undergraduate and postgraduate training programmes.^[3,15] This inadequate education in burns and pain management culminates in healthcare professionals who are managing patients with severe pain lacking the appropriate knowledge, attitudes and skills to manage analgesia requirements effectively.^[16]

System-related factors contributing to inadequate analgesia include drug stock-outs and budgetary restraints.^[10] A collective probe by four influential non-governmental organisations looking specifically at stock-outs of HIV and tuberculosis drugs identified

Table 2. Demographics of children included in file audit (N=59)

Age (years), median (IQR)	5 (1 - 9)
Gender, n (%)	
Female	32 (54)
Male	27 (46)
Total body surface area (%), median (IQR)	9 (1 - 35)
Depth, n (%)	
Superficial partial	21 (36)
Deep dermal	27 (46)
Full thickness	11 (18)
Mechanism, n (%)	
Hot water scald	41 (70)
Flame	9 (15)
Electrical	1 (2)
Hot surface	6 (10)
Hot food	2 (3)

IQR = interquartile range.

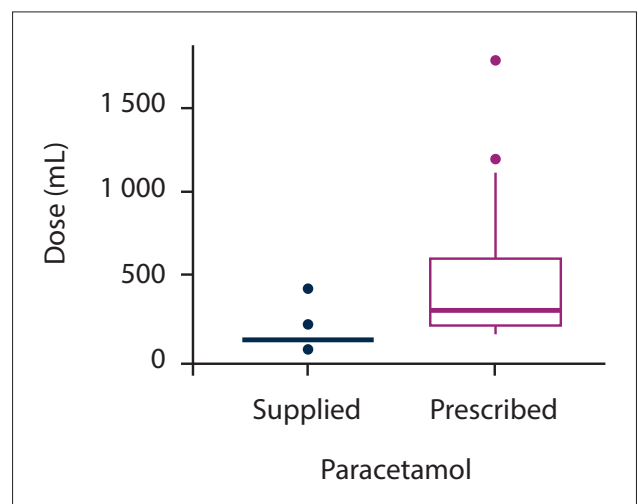


Fig. 1. Box plot of the discrepancy between paracetamol supplied and prescribed.

Table 3. Audit of analgesia supplied and prescribed

Scripts, N	59
Paracetamol syrup	
Patients prescribed paracetamol syrup, n	53
Difference between what was prescribed and what was supplied (mL), median (IQR)	170 (68.0 - 460.0)
Difference between what was prescribed and what was supplied (mg), median (IQR)	4 080 (960.0 - 11 040.0)
Ibuprofen syrup	
Patients prescribed ibuprofen syrup, n	24
Difference between what was prescribed and what was supplied (mL), median (IQR)	97 (47.0 - 327.5)
Difference between what was prescribed and what was supplied (mg), median (IQR)	2 200 (1 150.0 - 6 700.0)

IQR = interquartile range.

that a wide range of other essential medications, including analgesics, are also greatly affected by drug stock-outs in SA.^[10] Various factors contribute to these stock-outs, including a shortage of pharmacists, inadequate communication between suppliers, depots and facilities, corruption, and mismanagement within the supply chain.^[4] Another systems-related factor that may contribute to inadequate analgesia is the fact that the cost of the most effective analgesics may result in their being omitted from formularies.^[17] Our study highlights the issue that patients are given restricted volumes of analgesia regardless of the volume prescribed, resulting in inadequate analgesia owing to medication running out prior to their follow-up appointment.

Low drug stock levels and budgetary constraints are also in part to blame for patients receiving inadequate supplies of medication for analgesia. Pharmacy policies and procedures require pharmacists to confirm proper doses of prescribed medications,^[18] However, in resource-limited settings, in the case of drugs that are prescribed often by many disciplines, such as analgesics, the volume supplied is often limited in an attempt to stretch the resources as far as possible and ensure that more patients get some medication at least. This situation results in under-dosing of medication, even if it means that the medication may become depleted before the next visit to the hospital, in an attempt to provide as many patients as possible with at least some analgesia.

Study limitations

One of the limitations of this study is the sample size of doctors completing the questionnaire regarding background analgesia, which was restricted by the number of doctors encountered on outreach visits. Another limitation is the fact that patient compliance was not assessed as a further factor contributing to inadequate analgesia.

Recommendations

The dilemma of providing adequate analgesia to burn-injured patients is not an easy problem to solve. There are multiple barriers that need to be overcome for the situation to improve.

The first barrier that needs to be addressed is lack of education. A more substantial portion of undergraduate training needs to be dedicated to pain management. For surgical specialties, it is imperative that postgraduate trainees receive appropriate training in the management of burn care, including the intricacies of pain management in burn-injured patients. Trainees specialising in these fields should be required to do a clinical rotation through burns. An understanding of the pathophysiology of burns, and in particular burn pain, will allow these doctors to prescribe analgesia more judiciously to achieve better pain control for burn-injured patients. The better understanding of burn pain will also contribute to altering the perception that burns 'are just painful' and will promote the realisation that it is possible to achieve adequate analgesia for burn-injured patients. Practitioners across the board have knowledge gaps related to analgesia, both background and procedural, in paediatric burn patients. Educational efforts need to be aimed at all doctors managing burns.

System-related factors contributing to inadequate analgesia provision are more challenging to tackle. Improved communication between suppliers, depots and facilities would contribute to a more consistent supply of essential drugs. Many of the systems being used by supply chain management in developing countries are paper based, and implementing electronic ordering systems will improve efficiency. There also needs to be an improved understanding of supply and demand and improved management of stock to ensure

that orders are placed before stock levels become critically low, in order for new stock to arrive before the existing stock is depleted.

Conclusions

Burn-injured children commonly receive inadequate analgesia. The reasons for this are multifactorial. The correct dose and the correct drugs for burn-related background pain are deficits in the knowledge of doctors who deal with this common problem. Furthermore, even if the correct drug and dose are prescribed, the correct volume of medication is often not issued by the pharmacy. This study highlights barriers to achieving adequate analgesia in children with burns being managed as outpatients, and potential strategies to overcome barriers include improving education with regard to pain management and burns at an undergraduate and postgraduate level, and improved supply chain management.

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