



# An audit of paediatric pain prevalence, intensity, and treatment at a South African tertiary hospital

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## Abstract

**Introduction:** Pain in paediatric inpatients is common, underrecognised, and undertreated in resource-rich countries. Little is known about the status of paediatric pain prevention and treatment in low- and middle-income countries.

**Objectives:** This audit aimed to describe the prevalence and severity of pain in paediatric patients at a tertiary hospital in South Africa.

**Method:** A single-day prospective observational cross-sectional survey and medical chart review of paediatric inpatients at Grey's Hospital, Pietermaritzburg, South Africa.

**Results:** Sixty-three children were included, and mean patient age was 9.7 years (SD 6.17). Most patients (87%) had pain during admission, with 29% reporting preexisting (possibly chronic) pain. At the time of the study, 25% had pain (median pain score 6/10). The worst pain reported was from needle procedures, including blood draws, injections, and venous cannulation (34%), followed by surgery (22%), acute illness/infection (18%), and other procedures (14%). Pharmacological treatments included WHO step 1 (paracetamol and ibuprofen) and step 2 (tramadol, tilidine, and morphine) analgesics. The most effective integrative interventions were distraction, swaddling, and caregiver participation. Although a pain narrative was present in the majority of charts, only 16% had documented pain intensity scores.

**Conclusion:** The prevalence of pain in hospitalised children in a large South African Hospital was high and pain assessment inadequately documented. There is an urgent need for pain education and development of guidelines and protocols, to achieve better pain outcomes for children. This audit will be repeated as part of a quality-improvement initiative.

**Keywords:** Paediatric inpatients, Pain prevalence, Pain intensity, Pain management, Pain assessment

## 1. Introduction

The poor recognition and substandard management of paediatric pain has been a long-term concern; already in 1992, Johnston et al.<sup>40</sup> found that pain in a randomly selected population of

hospitalized children was underrecognized and/or undertreated, and in 1996, Cummings et al. executed the very first study looking at the prevalence of pain on an unselected population of an entire paediatric hospital, finding similar results and calling for a more aggressive management of paediatric pain.<sup>23</sup>

A joint statement issued by the World Health Organization and the International Association for the Study of Pain (IASP) on October 11, 2004, declared: "The relief of pain should be a human right."<sup>27,76</sup> The 2010 Declaration of Montreal went even further, stating that access to pain management is a fundamental human right and it is a human rights violation not to treat pain.<sup>39</sup> However, researchers at a large children's hospital in North America and Western Europe reported that inpatient pain was common, underrecognised, and undertreated, even in well-resourced tertiary referral paediatric centres.<sup>9,27,56,60,64,76,80,84</sup> Moreover, one of the largest paediatric health centres in the United States found that, despite the existence of a busy inpatient and outpatient paediatric pain consult team, there was significant room for improvement in how pain was managed.<sup>27</sup>

Assuming that the ability to manage pain is one of the factors that divide low-income countries from high-income countries,<sup>11</sup> we might expect at its best, similar results if not worse in countries with fewer resources. The African continent bears 24% of the global burden of disease, but only 3% of the health care force; for example, the United States and Canada have 2.6 and 2.5 doctors

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per 1000 patients, respectively, whereas South Africa only has 0.8.<sup>87</sup>

In a review of challenges associated with paediatric pain management in Sub-Saharan Africa, Albertyn et al.<sup>1</sup> stated that paediatric pain management in the region has been left largely unaddressed; many factors such as limited resources, inadequate training, cultural diversity, and language barriers result in sick and injured children not receiving basic pain treatment. Other researchers have found that children face exclusion from adult palliative care services even if paediatric ones are nonexistent, and their pain management is in general neglected. Moreover very limited data on paediatric pain are available in this region.<sup>37</sup>

Grey's Hospital is a referral hospital in Pietermaritzburg, KwaZulu-Natal, South Africa. It offers tertiary services to the western half of the province, which includes 5 health districts serving a total population of 3.5 million. With a total of 505 staffed beds, approximately 30 are for surgical paediatric patients and 48 for medical paediatric patients, most of the older children and adolescents commonly get admitted to the adult wards.<sup>33</sup> Pain management is provided by the primary care team for the majority of paediatric patients. In 2015, an unpublished paediatric postoperative pain audit was conducted over 10 months and included 505 patients. Unexpectedly, it found that 81% children experienced pain in the postoperative period, and in more than half, the pain was moderate to severe. However, this audit was limited in that it did not record patient sex, presence of chronic pain, and only focused on surgical patients. To address these limitations, we planned to conduct an audit of paediatric pain assessment and management across the whole hospital, hypothesizing that pain, both acute and chronic, was an unresolved problem in our paediatric inpatients.

## 2. Methods

We conducted a single-day unannounced prospective observational cross-sectional survey and medical chart review of all paediatric inpatients younger than 18 years of age admitted at Grey's Hospital, Pietermaritzburg, on Monday, March 13, 2017. Patients admitted into the neonatal intensive care or paediatric intensive care were excluded due to logistic reasons. The survey aimed to benchmark both patient outcomes (ie, pain prevalence, pain intensity, and satisfaction with pain management) and process outcomes (ie, pain assessment documentation and pain management interventions).

The study was approved by the Umgungundlovu Health Ethics Review Board on October 2016 (Reference UHERB160701) and KwaZulu-Natal Department of Health on January 2017 (HRKM Ref: 231/16; NHRD Ref: KZ-2016RP18-692).

The survey and methodology used was derived from a tool used by Friedrichsdorf et al. (2015, 2018) and Taylor et al. (2008).<sup>27,56,76</sup> Research assistants were trained before administering the survey in a workshop organised by the main researcher (C.V.C.). On the morning of the survey, the interviewer introduced the project directly to patients and their parents using a short script. If the child and parent provided verbal assent/consent to participate, the interviewer administered a 5- to 10-minute questionnaire and recorded the answers. Interpreters were used for all non-English-speaking families because such patients are known to be at greater risk of receiving substandard pain management.<sup>27,76</sup>

Patients were interviewed directly if older than 5 years, and were judged by the interviewer to be cognitively able to understand the questions. If this was not the case, the parent or caregiver was interviewed as proxy for the child. The children/

parents were asked about their pain experience, the single "worst pain" in the past 24 hours, and they were asked to rate their satisfaction with how their pain was treated.

Once the interview was completed, a chart review was conducted for all the patients in the final sample to obtain information about documentation of pain assessment, and pharmacological and nonpharmacological pain interventions provided by staff. A unique number was assigned to each patient listed on the morning registration list, which was recorded on the survey and chart review form to maintain a link between the patients and their survey/chart review data.

Data were transcribed into an electronic database, and Stata 15.1 was used for analysis. Frequency and percentage were used to describe the study sample. Parametric and nonparametric tests were used for normally and nonnormally distributed data, respectively.  $\chi^2$  tests were used for categorical data. A *P*-value of <0.05 was deemed to be statistically significant.

## 3. Results

Of a total of 68 children inpatient at 8:00 hours on the chosen day, 63 patients (93%) were included in the survey. In more than half of the cases (52%), the child was the main respondent followed by the mother (44%), and the rest was answered by other caregivers. The mean patient age was 9.7 years (SD 6.17 years; range 1 month–17 years; interquartile range 12.07 years). Both surgical and medical patients, and females and males were equally represented (**Table 1**).

**Table 1**  
Demographic characteristics of paediatric patients recruited (Grey's hospital).

	n (%)
Time in hospital >24 hours	63 (100)
Age	
<3	15 (24)
3–10	19 (30)
>10	29 (46)
Speciality	
Medicine	30 (48)
Surgical	33 (52)
Gender	
Female	30 (48)
Male	33 (52)
Admission	
Planned	15 (24)
Unplanned	48 (76)
Language	
Zulu	57 (90)
English	2 (3)
Afrikaans	2 (3)
Xhosa	1 (2)
Other	1 (2)
Respondent	
Patient	33 (52)
Mother	28 (44)
Other	2 (3)
Reason for admission	
Surgery	12 (19)
Accident or injury	23 (36)
Diagnostic workup	5 (8)
Treatment of known disease	5 (8)
Acute illness	16 (25)

**Table 2**

**Prevalence of pain before admission, during admission, and at the time of survey, and “worst cause of pain” in the 24 hours preceding the survey.**

	<b>N (%)</b>
Pain before admission	18 (29)
Pain on admission	55 (87)
Pain during survey	16 (25)
Worst cause of pain in past 24 hours	
Needle stick	19 (34)
Surgery	12 (22)
Acute illness or infection	10 (18)
Procedure	8 (14)
Trauma/injury/other	6 (11)
Of the 16 with pain	Minimum pain score was 2, max was 10 (n = 3), mean pain 6, median 6

Eighteen children (29%) reported routinely having pain before the current admission: half experienced abdominal pain, followed by musculoskeletal pain and headache. The majority of children experienced some pain during their hospitalisation (87%). A quarter of patients were experiencing pain during the interview with 37% being in severe pain (**Table 2**).

There was no difference in pain prevalence and intensity between different age groups during preadmission, admission, and during the survey ( $P = 0.08$ ;  $P = 0.485$ ;  $P = 0.184$ ). No difference was found between prevalence and intensity of pain according to sex ( $P = 1.0$ ) ( $t = -0.8288$ ; degrees of freedom = 14) or between medical or surgical patients ( $P = 0.136$ ) (1-sided Fisher exact 0.100).

Out of the 55 patients who experienced pain during the admission, more than a third of those children and families considered pain caused by needle stick to be their worst pain experience while in hospital (34%). Surgery was considered the worst pain by 22%, followed by acute illness (18%), procedures (14%), and trauma and injury (11%).

Although needle stick was the most common cause of “worst pain,” its intensity was the lowest of all the “worst pain.” Procedures and surgery had the highest intensity with a median pain score of 10 and 9, respectively (**Fig. 1**). For venipuncture, drip insertion, and abdominal surgery (the most common causes of worst pain), there was no difference in pain score when patients were forewarned as compared to not being forewarned ( $P = 0.552$ ) ( $t = -0.6061$ ; degrees of freedom = 18).

On a scale from 0 (not satisfied at all) to 10 (most satisfied), satisfaction with pain management was rated as high (mean 8, median 8, range 0–10). Seventy-five percent of respondents who had questions and concerns about pain reported that staff listened to them and eased their worries, but 2 children felt ignored when they were in pain. The rest of the children and/or caregivers did not have questions related to their pain or did not remember if they did. The majority of patients (71%) indicated that they would move to a different health facility if better pain management was offered there.

When considering process outcomes, 80% of files contained some pain narrative, the overwhelming majority written by nurses. For the 55 patients who experienced pain, only 9 surgical patients (16%) were assessed using a validated pain scoring tool and most of them (11%) had only one pain assessment within the past 24

hours; no medical patient was assessed with a validated tool. Of children who experienced pain during the past 24 hours, 82% had been prescribed analgesic medication (45/55), 44 of them around the clock (all of them surgical patients) and only one as needed (medical patient). The majority of those without prescribed analgesia were medical patients (80%). More details on the prescribed pharmacological treatments are shown in **Figure 2**. Documentation of integrative “nonpharmacological” pain management techniques occurred less frequently than for pharmacological options.

Medication was the most commonly used pain treatment (34 patients) and was found to be moderately useful (median of 5). Positioning was offered to 11 children with a median helpfulness of 4.5. Caregiver presence and distraction were found to be very helpful (median score of 8) and used in 10 and 11 patients, respectively. Swaddling was executed only in 4 patients, but was found to be the most helpful nonpharmacological treatment with a median score of 9. Sucrose was only administered to one infant.

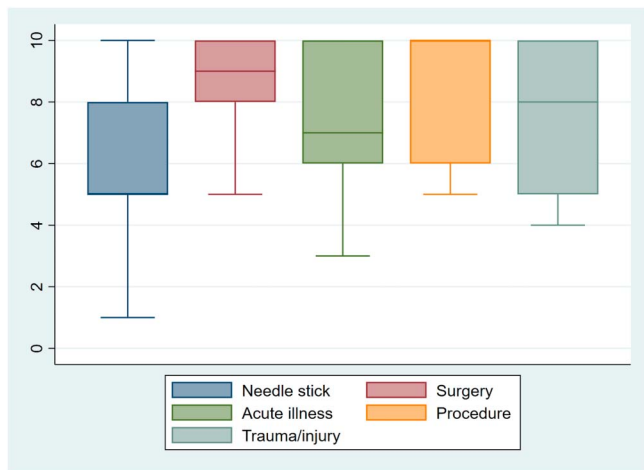
#### 4. Discussion

To the best of our knowledge, this is the first prospective observational cross-sectional pain survey and medical chart review of all paediatric inpatients in a hospital in Africa, a previous study in the South African setting was executed in 2011 by Thiadens et al.,<sup>77</sup> although it was a great start was only restricted to a Paediatric Trauma Unit and chronic pain was not assessed. This study highlights that unfortunately pain treatment and prevention in paediatric inpatients remain an unresolved challenge more than 2 decades after Cummings sought its improvement.<sup>23</sup> The majority of the children experienced pain during admission, with many having moderate to severe pain. These findings are similar to those previously reported by studies in high- and upper-middle income countries.<sup>27,44,46,64,76,84</sup> Extensive evidence about the prevention and treatment of pain in children exist,<sup>87</sup> and multiple paediatric pain guidelines have been developed.<sup>66,68</sup> However, there remains a significant knowledge translation gap (“between what we know and what we do”) when it comes to paediatric pain.<sup>65,89</sup>

Nearly one-third of patients experienced pain routinely before their admission, possibly chronic in nature, in keeping with epidemiological studies showing rates of chronic and recurrent pain in children of 15% to 30%.<sup>18,36,47,60</sup> Five percent of children and teenagers in the general population experience significant pain-related dysfunction, depression, and anxiety.<sup>22,28</sup> Chronic pain may have a better prognosis if treated early in life than if it is allowed to persist into adulthood,<sup>61</sup> which is unfortunately the norm at present.

According to the IASP recommendations, children with chronic pain should be treated in multidisciplinary outpatient clinics where the biopsychosocial model of pain prevails, but a large number of patients do not have access to them.<sup>27,28,51,76</sup> There is currently no paediatric pain clinic and an urgent need for such a service in our setting.

Studies assessing sex differences in paediatric pain had shown ambiguous results. Some have shown a higher prevalence and/or pain intensity in female patients,<sup>28,43,44,48,52,83</sup> whereas others were unable to find any sex differences.<sup>21,76</sup> Our results agreed with the latter, but our small sample size might preclude finding a difference. It is not known whether females experience greater pain, or if they verbalize it more often, and cultural factors could be contributing.<sup>53,55,85</sup>



**Figure 1.** Intensity of the “worst cause of pain” in the 24 hours preceding the survey.

There were no differences by age in the prevalence of pain or its intensity during either preadmission, admission, or during the survey. Although similar results were found by Noll et al.,<sup>52</sup> most studies have found differences based on age.<sup>11,43,48</sup> Once again, it is possible that our findings were affected by the small size of the sample.

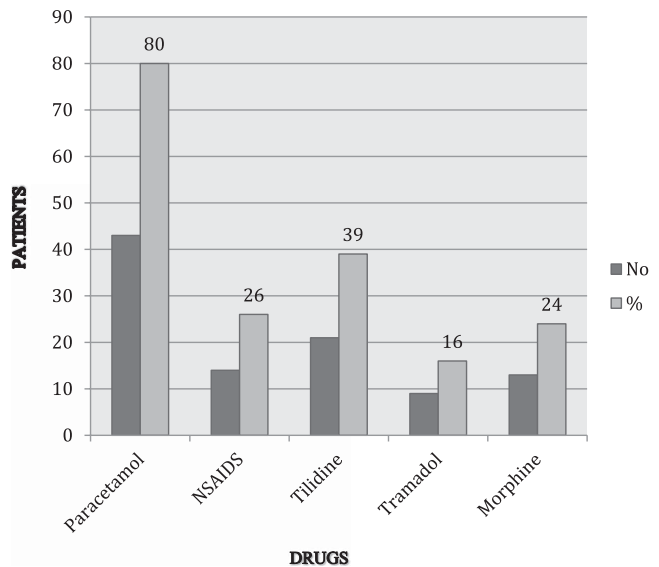
Our study did not include neonates, thereby excluding a vulnerable and historically neglected subgroup of children at higher risk of experiencing pain.<sup>4</sup> Unrelieved pain in infancy and early childhood can lead to persistent and chronic pain, as well as other physiological and psychological deleterious effects.<sup>18,60,78,89</sup> The prevalence of pain in neonates as well as its management in our population deserves to be explored in further studies.

Pain caused by needles was found to be the most prevailing cause of “worst pain,” which has been described before.<sup>9,27,63,68,84</sup> As with Friedrichsdorf<sup>27,56</sup> and others,<sup>19,62,84</sup> we noted that although needle pain was mentioned as the most painful experience, the reported pain intensity was actually lower than postsurgical pain and some postprocedural pain. Reasons for this discrepancy are likely multifactorial. Factors such as fear, anxiety, lack of control, memory of previous painful procedures, or the trauma of being excessively restrained can reinforce pain.<sup>54</sup> The lower intensity of the pain does not make it less disturbing, pain associated with needle poke is often worse than the underlying reason for hospitalisation and makes the children feel helpless, anxious, and irritable, can sensitise them to pain, and can trigger “needle phobia” and PTSD<sup>9</sup>; the presence of procedural pain is particularly concerning, given the fact that is purely iatrogenic and preventable.

Current best evidence,<sup>71,73,74</sup> supported by clinical guidelines<sup>13,34,38,49,50,72</sup> and science-to-social media campaigns (eg, “Be Sweet to Baby”<sup>17</sup> and “It Doesn’t Have to Hurt”<sup>15</sup>), provide evidence for a 4 bundled modality. The successful “Comfort Promise” (a protocol offered as a bundle to all children for all elective needle procedures all the time) has been recently published by Friedrichsdorf et al.,<sup>29</sup> and includes:

- (1) Topical anesthesia<sup>75</sup>
- (2) Sucrose<sup>32,67</sup> or breastfeeding<sup>59</sup> for infants<sup>17</sup>
- (3) Comfort positioning<sup>41</sup>
- (4) Age-appropriate distraction<sup>81</sup>

The paediatric pain team should be available to provide analgesia and sedation if the above-mentioned approach fails to comfort the child.<sup>30,84</sup>



**Figure 2.** Pharmacological treatment prescribed to patients who experienced pain during admission. NSAIDs, nonsteroidal anti-inflammatory drugs; tilidine, synthetic opioid analgesic.

For venipuncture, venous catheter insertion, and abdominal surgery, the 3 most common causes of “worst pain,” there were no differences in pain intensity regardless of whether the patient was warned about the possibility of experiencing pain or not. Although some researchers have arrived at the same conclusion,<sup>45,70</sup> others found that reassuring words improved the subjective experience during invasive procedures.<sup>82</sup> Ideally, the child should be provided with both procedural and sensory information at the right time and in an age-appropriate format.<sup>20,69</sup>

Interestingly, although most of our patients experienced pain during admission, satisfaction with pain treatment was high. This has been formerly depicted, but the contributing factors are poorly understood.<sup>14,58</sup> Treatment expectations as well as past pain experiences are known to correlate more with patient satisfaction than the treatment used, and the actual reduction in pain symptoms.<sup>5</sup>

Most of the medical files reviewed included some pain narrative, with the overwhelming majority written by nurses, in keeping with previous surveys.<sup>44</sup> Although some studies have found better pain knowledge in doctors than in nurses,<sup>3,88</sup> patients spend significantly more time with nurses than with any other health care provider.<sup>24</sup>

It was disappointing to find that most patients who experienced pain during their admission had no validated tool used for their pain assessment, a problem already discovered by other researchers.<sup>27,76,84</sup> Validated developmentally appropriate pain measurement tools are available for all ages, and should be used for every child.<sup>57</sup>

Eighty-two percent of the children who experienced pain during admission were prescribed medication, most of them around the clock. This was better than results from previous studies,<sup>27,76</sup> and similar to others.<sup>44</sup> The majority of those without prescribed pain medication were medical patients. During the past few decades, awareness of the deleterious effects of suboptimal postoperative pain management has grown exponentially,<sup>31</sup> the IASP nominated 2017 as the Global Year Against Pain After Surgery, and many events and initiatives were held all over the world increasing awareness of surgical pain. Medical patients experiencing nonsurgical nociception suffer from pain as well as their surgical counterparts,<sup>44</sup> it is just less recognized.

The WHO Guidelines on the Pharmacological Treatment of Pain in Children<sup>86</sup> and The South African Acute Pain Guidelines<sup>8</sup> were followed adequately in most of the patients. The majority received regular paracetamol; the second most prescribed drug was tilidine, followed by nonsteroidal anti-inflammatory drugs (NSAIDs)—mostly ibuprofen, and tramadol. Although all the patients receiving morphine (24%) were also receiving paracetamol and either NSAIDs or a weak opioid, 75% of them were administered morphine intramuscularly in violation of the above-mentioned guidelines.

Tilidine was administered orally in more than 3/4 of the patients, although the South African Guidelines recommend the sublingual route. This is a controversial recommendation; sublingual administration allows direct access of drugs to the systemic circulation decreasing the onset of action,<sup>42</sup> but tilidine's therapeutic activity is mainly related to its active metabolite nortilidine. Its formation mainly occurs during the intestinal and hepatic first-pass metabolism of tilidine by N-demethylation.<sup>26</sup> Further research should look at this polemic to help us decide the ideal route of administration of this drug.

In line with other studies,<sup>27,46,84</sup> "nonpharmacological" pain techniques were not commonly documented. Pain management often excludes evidence-based nonpharmacological modalities because patients and health care providers might be unaware of their availability, are sceptical about their efficacy, or fear possible complications from their use.<sup>7</sup> The lack of well-designed clinical trials might also be contributing.<sup>79</sup>

Although the pharmacological was the most common used pain management modality, 3 nonpharmacological techniques were reported by children and parents as being effective (distraction, caregiver presence, and swaddling); similar results were found by Friedrichsdorf.<sup>4,27,56</sup> All these techniques are simple, safe, and cost-effective, and should be a mandatory component of the multimodal approach to pain management.<sup>2,6,12,35</sup>

Dissemination and implementation of knowledge into practice is challenging; parental and health care misconceptions and attitudes towards pain are some of the barriers to effective pain management in our setting but so are the lack of resources and qualified staff. The prevalence of paediatric pain according to family caregivers is the closest to children reports, followed by the assessment done by physicians and nurses<sup>25</sup>; then, it makes sense to train parents to assess their children's pain, the initiative we are trying to implement in our hospital. In a similar study executed in Brazil, 68% of the parents were present when data were collected; unfortunately, during our study less than half of the parents were available due to specific socioeconomic and cultural characteristics of our population. Social media, internet-based applications, and web-based platforms have been used successfully in high-income countries,<sup>10,16</sup> but booklets and posters are our main mean of instruction for obvious reasons.

#### 4.1. Limitations

This was a single-center study taking place on a single albeit representative day with a small sample size, which may limit generalizability of our findings. A national multicentre audit is being planned to address these limitations.

## 5. Conclusion

The prevalence of pain in hospitalised paediatric patients in Grey's Hospital is unacceptably high, including a big subgroup of

children with possible chronic pain, for whom the hospital does not provide an Interdisciplinary Rehabilitative Pain Clinic at present. Pain assessment is poorly performed and documented. Procedural pain is the worst cause of pain according to most of the children and their parents, and nonpharmacological modalities of pain treatment are underutilised. There is an urgent need for pain training and education, and the implementation of guidelines and protocols for pain assessment, prevention and treatment, procedural pain, and medical patients in particular needs more attention. This audit will be repeated as part of a quality-improvement initiative.

## Disclosures

The authors have no conflict of interest to declare.

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