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An audit of cancellation of elective surgery in paediatric patients at Chris Hani Baragwanath Academic Hospital

Nomdumiso Gamede



A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, Johannesburg, in the partial fulfilment of the requirements for the degree of Master of Medicine in the branch of Anaesthesiology

Johannesburg, 2021

Declaration

I, Ien Nomdumiso Gamede, herewith declare that this research report is my own, unaided work. It is being submitted for the degree of Master of Medicine at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at any other University.



_____

Signed

On this_____09_____day of___February_____2022

Dedication

This project is dedicated to my family especially my mother Gladys Gamede, thank you so much for the support and love. To my daughter Kubeyinkosi, this is for you my princess. I also dedicate this project to my friends who supported me through all difficult times and assisted with completing the project.

Presentations and publications from this research project

No publications or presentations to date.

Abstract

Background

Cancellation of elective surgery is one of the quality indicators of theatre operation worldwide. The cancellation of elective surgery in paediatric patients is a world-wide problem with the rates ranging from 0.21% to 44%. This study aimed to determine the rates and describe the reasons for cancellation of elective surgeries in paediatric patients at Chris Hani Baragwanath Academic Hospital (CHBAH).

Methods

A retrospective study was conducted using theatre records from 01 January to 31 December 2019. The numbers and reasons for elective paediatric surgeries were reviewed. Data was collected using structured collection sheet and entered into Microsoft excel. Statistical Package for Social Sciences was also used to further analyse the data. Results were expressed as percentages in table forms.

Results

In the year 2019, a total of 3399 elective paediatric procedures were scheduled in fourteen specialties at CHBAH. Of these, 634 (19%) were cancelled due to various reasons. The highest number of cases cancelled were from paediatric surgery and neonates (n=204, 31%), followed by ENT (n=99, 24%), burns (n=80, 20%) and paediatric orthopaedics (n=79, 16%). The lowest number of cancelled cases came from urology (n=3, 17%) and hands (n=3, 3%). The commonest reason for cancellation of elective surgery in paediatric patients at CHBAH was found to be time constraint (34%) followed by patients not arriving for surgery (16%). The reasons for cancellation in our study were mostly due to avoidable factors at 68% and non-avoidable at 32%.

Conclusion

The rate of cancellation in our study was high but comparable to other African and South African studies. Majority of the causes for cancellation were avoidable.

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TABLE OF CONTENTS

DECLARATION ..... **ii**

DEDICATION ..... **iii**

PRESENTATIONS AND PUBLICATIONS FROM THIS RESEARCH PROJECT ..... **iv**

ABSTRACT ..... **v**

Background v

Methods v

Results v

Conclusion v

ACKNOWLEDGEMENTS ..... **vi**

TABLE OF CONTENTS ..... **vii**

LIST OF TABLES ..... **viii**

APPENDIX LIST ..... **ix**

LISTS OF ABBREVIATIONS ..... **x**

DRAFT ARTICLE **1**

Introduction 2

Methods 2

Results 4

Discussion 7

Limitations 11

Conclusion 12

References 13

APPENDICES **15**

LIST OF TABLES

Table 1: Number of cases booked, done and cancelled in each speciality 4

Table 2: Reasons for cancellations 5

Table 3: Reason for cancellation by each speciality 6

Table 4: The likelihood of time constraints (OR and 95% CI) by surgical speciality 7

APPENDIX LIST

Appendix 1: Proposal 15

Appendix 2: Human Research Ethics Committee clearance certificate 34

Appendix 3: CHBAH Medical Advisory Committee Approval 36

Appendix 4: Permission letter by Theatre Matron 37

Appendix 5: Permission letter by the CHBAH Anaesthesiology Head of Department 38

Appendix 6: Plagiarism/ Turnitin report cover page 39

Appendix 7: Journal guidelines to authors 40

LIST OF ABBREVIATIONS

CHBAH	Chris Hani Baragwanath Academic Hospital
URTI	Upper respiratory tract infection
ENT	Ear Nose and Throat
Paeds	Paediatrics
OR	Odds ratio
CI	Confidence interval
MRI	Magnetic resonance imaging
CT	Computerized tomography
MMed	Master of Medicine degree

Draft Article

An audit of cancellation of elective surgery in paediatric patients at Chris Hani Baragwanath Academic Hospital

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Introduction

Cancellation of elective surgery is one of the ways that shows poor efficiency in theatre performance.[1-3] The elective surgery postponement is a common problem worldwide that causes numerous detrimental effects on patients and their families, hospital finance and hospital staff.[1, 2, 4-7, 10-16] Therefore, theatre efficiency and management must be assessed on regular basis. The rates and reasons for cancellation of elective surgery varies between facilities from 0.21% to 44% worldwide.[4-9] The wide variation in the reasons for cancellation between hospitals is probably due to each institute's unique ethics, culture, staff pattern, demographics, general work load, availability of beds and the services it provides. [3, 11] There is no real consensus around the acceptable cancellation rate. [1, 2] Some literature recommends a rate less than 5% as acceptable. [1, 2, 17]

Studies at different hospitals have been performed to try and identify the facility specific causes for cancellation of elective surgery. Haana et al [16] and Bathla et al [4] showed cancellation rates of 7.2% and 7.6%, with different main reasons for cancellation, which were patient being medically unfit and upper respiratory tract infections (URTI) respectively. The description of the rates and reasons for cancellation of elective surgery becomes more significant in paediatric patients due to multiple difficulties associated with the planning and performing of surgery in this population group. [4, 16]

In South Africa's health institutions, few studies have been published reporting the rates and reasons for cancellation of elective surgery, especially in the paediatric population. Currently, there have been no reports or investigations done on the rate and reasons for cancellation in paediatric elective surgery at Chris Hani Baragwanath Academic Hospital (CHBAH). Therefore, a study to determine the rates and describe the reasons for cancellation of elective surgeries in paediatric patients at CHBAH was performed.

Methods

A retrospective study was conducted in the theatre complex of the CHBAH affiliated to the Department of Anaesthesiology at the University of the Witwatersrand. Chris Hani

Baragwanath Hospital has 29 theatres of which 17 may be used for paediatric elective procedures. Only complete paediatric theatre records from 01 January 2019 to 31 December 2019 in the following theatres and suites: paediatric surgery and neonates, paediatric orthopaedics (paeds ortho), ophthalmology, orthopaedic spine (ortho spine), neurosurgery, hands, burns, ear nose and throat (ENT), maxillofacial, cardiac catheterization laboratory (cardiac cath lab), bronchoscopy, urology, plastics and audiology were reviewed. Records from MRI, CT scan and angiography suites were excluded because the reasons for cancellation were not documented.

The number of cases booked, done and cancelled were reviewed for each speciality. The reasons for cancellation were placed into categories (patient- related, work-up related, medical condition related, resource-related, surgery-related, anesthesia-related, facility-related and other). These categories were then subdivided into various subcategories (see table 2) for the purposes of data collection. The above information was collected using a structured data collection sheet. Data was captured in Microsoft Excel and results were expressed as tables. Statistical Package for Social Sciences was used to further analyze data. The likelihood of time constraints for different surgical specialties against a reference group (paeds surgery and neonates) was estimated by Odds ratio and confidence interval using Chi-squared analysis. A P-value < 0.05 was statistically significant.

The categories of reasons for cancellation were described as avoidable and non-avoidable. This was purely subjective based on the authors idea of what is avoidable vs what is non-avoidable and if appropriate steps are taken the description of whether factors are avoidable or non-avoidable changes. Avoidable factors were the reasons judged as potentially avoidable because some intervention or protocol could be implemented to try decrease cancellations and these factors were resource related, patient related, surgery related, work up related and other. Non-avoidable factors were the reasons where no intervention or protocol could be implemented to try reduce cancellations and these included facility related, medical related and change of guardian's mind in patient related factors. The study was approved by the Human Research Ethics Committee (Medical) and the Postgraduate Studies Committee of the University of Witwatersrand.

Results

In the year 2019, a total of 3399 elective paediatric procedures were scheduled in fourteen specialties at CHBAH. Of these, 634 (19%) were cancelled due to various reasons. The highest number of cases cancelled were from paediatric surgery and neonates (n=204, 31%), followed by ENT (n=99, 24%), burns (n=80, 20%) and paediatric orthopaedics (n=79, 16%). The lowest number of cancelled cases came from urology (n=3, 17%) and hands (n=3, 3%). The number of cases booked, done, cancelled and the cancellation rate by surgical speciality is described in Table 1.

Table 1: Number of cases booked, done and cancelled in each speciality

Speciality	No cases booked	No cases done	No of cases cancelled	Cancellation rate
Ortho spine	12	8	4	33%
Bronchoscopy	41	28	13	32%
Paeds surgery and neonate	649	445	204	31%
Cardiac cath lab	156	112	44	28%
Audiology	45	34	11	24%
ENT	412	313	99	24%
Burns	471	391	80	20%
Neurosurgery	160	129	31	19%
Urology	18	15	3	17%
Paeds ortho	492	413	79	16%
Maxillofacial	49	44	5	10%
Plastics	157	142	15	10%
Ophthalmology	619	576	43	7%
Hands	118	115	3	3%
Total	3399	2765	634	19%

Reasons for cancellation placed in categories are described in Table 2.

Table 2: Reasons for cancellations

Categories	Cancellation reasons	Cancellation numbers	Subtotal (n)	Percentage of total (%)
Resource related	Time constraint	215	215	34
	Lack of staff	0		
	Linen and autoclave unavailability	0		
Patient related	Patient did not arrive	103	139	22
	Consent issues	13		
	Guardian change of mind	6		
	Nil per os pre-op instruction not followed	17		
	Refusal of operation	0		
Facility related	No post op placement	68	111	18
	No water or electricity	23		
	Equipment failure or availability	20		
Medical condition related	Unfit for surgery	89	94	15
	Change of medical condition	5		
	Change of treatment plan	0		
Other	Back up case	13	35	6
	Done in other theatre	18		
	Not in the ward	4		
Surgery related	Surgery unnecessary	21	28	4
	Surgeon unavailable	7		
Work up related	Incomplete or not acted upon	12	12	2
Anaesthesia related	Anaesthetist unavailable	0	0	0

The reasons for cancellation by surgical speciality are presented in Table 3 below. The most common reason for cancellation in each speciality is highlighted in bold text.

Table 3: Reasons for cancellation by each speciality

Speciality	No cases cancelled	Patient related	Work up related	Medical condition related	Surgery related	Facility related	Resources related	other
				n(%)				
Paeds surgery and neonates	204	48(24)	9(4)	16(8)	9(4)	35(17)	**77(38)**	10(5)
ENT	99	14 (14)	1 (1)	9(9)	2 (2)	**39 (39)**	28 (28)	6 (6)
Burns	80	11 (14)	1 (1)	**25(31)**	9(11)	4 (5)	24 (30)	6 (8)
Paeds ortho	79	2 (3)	0 (0)	2 (3)	1 (1)	23 (29)	**47 (60)**	4 (5)
Cardiac cath lab	44	**23 (52)**	0 (0)	16(36	0 (0)	0 (0	4 (9)	1(23)
Ophthalmology	43	**16 (37)**	1 (2)	13(30)	4 (9)	1 (2)	8 (19)	0 (0)
Neurosurgery	31	2 (7)	1 (3)	4 (13)	0 (0)	0 (0)	**23 (74)**	1 (3).
Plastics	15	2 (13)	0 (0)	2 (13)	**3(20)**	**3 (20)**	2 (13)	**3(20)**.
Bronchoscopy	13	**12 (92)**	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (7)
Audiology	11	**7 (64)**	0 (0)	3 (27)	0 (0)	0 (0)	0 (0)	1 (9)
Maxillofacial	5	1 (20)	0 (0)	**2 (40)**	0 (0)	1 (20)	1 (20)	0 (0)
Ortho spine	4	0 (0)	0 (0)	0 (0)	0 (0)	**4 (100)**	0 (0)	0 (0)
Hands	3	0 (0)	0 (0)	**3 (100)**	0 (0)	0 (0)	0 (0)	0 (0)
Urology	3	**1 (33)**	0 (0)	0 (0)	0 (0)	**1 (33)**	**1 (33)**	0 (0)

The commonest reason for cancellation of elective surgery in paediatric patients at CHBAH was found to be time constraint. Using the paediatric surgery and neonates as a reference (it was the busiest paediatric speciality with the most cases booked , thereby taking up the most human and potential financial resources to run), the likelihood of time constraints contributing to case cancellation by surgical speciality is described in the table below (Table 4). There is no gold standard for theatre cancellation due to time constraints. Only the surgical specialities with the cases cancelled due to time constraint were included in the table 4.

Table 4. The likelihood of time constraints (odds ratio and 95% confidence interval) by surgical speciality

Surgical speciality	Cases booked	No (%) of cancelled cases	Odds ratio (95% confidence interval)	P value*
Paeds surgery and neonates	649	77 (11.9%)	1 (reference)	
Paeds ortho	492	47 (9.6%)	0.78 (0.53 - 1.15)	1
ENT	412	28 (6.8%)	0.54 (0.34 – 0.85)	0.0525
Burns	471	24 (5.1%)	0.4 (0.25 – 0.64)	0.0005
Neurosurgery	160	23 (14.4%)	1.25 (0.76 – 2.06)	1
Ophthalmology	619	8 (1.3%)	0.1 (0.05 – 0.2)	<.0005
Cardiac cath lab	156	4 (2.6%)	0.2 (0.07 – 0.54)	0.0007
Plastics	157	2 (1.3%)	0.1 (0.02 – 0.39)	<.0005
Maxillofacial	49	1 (2.0%)	0.15 (0.02 - 1.14)	0.1086
Urology	18	1 (5.6%)	0.44 (0.06 – 3.33)	1

*Bonferroni-corrected for 9 multiple comparisons with reference speciality (Paeds surgery and neonates).

Discussion

The cancellation rate at CHBAH was much higher at 19% compare to other studies [Kaddoum et al (4.4%), Chiu et al (7.6%), Bathla et al (7.6%), Okeke et al (9.1%)] and more than 3 times the recommendation value of less than 5%[1, 2, 4, 5, 17, 18]. Even though our overall cancellation rate was high, it was still lower than some African and other South African studies such as Lankoande et al [8], Desta et al [7], Bhuiyan et al [19] and Asmal et al [17] [36.9%, 31.6%, 44.5% and 26.2%, respectively]. The highest number of cases cancelled were from paediatric surgery and neonates (n=204) even though the cancellation rate was not the highest (31%). The dominant reason for cancellation in this discipline was time constrain, and this was probably due to overbooking and under estimation of duration of the surgery.

The paediatric surgery and neonatal lists book both inpatient and outpatients. The parents or family are contacted telephonically prior to booking but there may be problems encountered

such as no response, transport issues or short notice and this could have contributed to overbooking. Okeke et al [18] found general surgery to have the highest number of cancelled cases and patient related factors were the main contributing reasons for cancellation.

Ortho spine and bronchoscopy had the highest cancellation rates (33% and 32%, respectively) even though the actual number of cases cancelled were low (n=4 and n=13, respectively). Therefore, the higher the number of cases booked did not correlate with the highest cancellation rate. Cancellation in ortho spine was due to unavailability of an ICU bed in hundred percent of the cases. Bronchoscopy had cancellations mostly due to patients not arriving on the schedule day as the majority were day case surgeries. Pratap et al [14] also found outpatients not arriving on the scheduled day of surgery as the main reason for cancellation.

Our study also showed the lowest cancellation rates (3% and 7%) from hands and ophthalmology specialities. This was possibly due to realistic list bookings, compliant patients, concerns about vision loss and, appropriate preoperative counselling about the need and urgency for surgery. In the study by Boudreau et al [13], ophthalmology also had the lowest number of cancellations but specific reasons were note stated.

The main reason for cancellation was time constraint (34%), which falls into resource related category. Compared paediatric surgery and neonate, the odds of no available operating time was significantly less in ENT, burns, ophthalmology, plastics and the cardiac catheterisation list. The mostly likely reasons probably related to the booking of the realistic lists and in burns theatre, most booked patients are considered as emergencies and therefore every patient gets done. The long duration of operation in neurosurgery may have contributed to the increased cancellations. Chiu et al [2] reported a significantly lower chance of no available operating time in orthopaedics, otolaryngology, neurosurgery, gynaecology, ophthalmology and dentistry compare to general surgery.

Time constraint was a problem across all specialities at 34% with different contributing factors which were mostly modifiable and had a significant impact on cancellations of

elective paediatric surgery. This was comparable to 41% and 30% reported by Asmal et al [17] and Bekele et al [9], respectively. Overbooking and under estimation of duration of the surgery were issues in paediatric surgery and neonates at 38%. These were the main factors which contributed to most patients being cancelled due to time constraints; but they were not universal across all specialities because ophthalmology had a significantly large number of cases booked (619) and only 43(7%) were cancelled. Other factors such as patients not prepared for theatre, slow turn over time, delayed starting time, unavailability of linen, staff and equipment could have impacted on time constraints as a reason for cancellation.

Our cancellation rate due to patients not arriving for theatre was 16% and it was the second commonest reason for cancellation. Bronchoscopy, audiology, cardiac cath lab and ophthalmology were the main specialties where a significant number of patients did not arrive for the procedure because most patients in these specialities are outpatients. This could be reason for overbooking in some speciality leading to a high cancellation rate and contributing to time constraint being the significant reason for cancellation. In the study by Pratap et al [14], the cancellation of patients due to no show of patients accounted for 21% of cancellations, which was the second commonest reason in this study. Hanna et al [16] reported patient failing to attend (11.3%) as one of the top three reasons for cancellation in an Australian paediatric hospital. Multiple factors could have an impact on patients not arriving for surgery such as financial challenges, time off work, miscommunication and seeking alternative care.

Communication between the hospital and the guardian or parents seems to be a serious issue contributing to cancellation of elective surgery in paediatric patients. There is no formal communication program or protocol in place for all elective surgeries at CHBAH that may facilitate the effective preoperative communication amongst every part involved in planning the surgery. Multidisciplinary team meeting is the only form of communication that is available for complicated planned surgery, and most cancellations are for elective outpatients presenting for minor surgeries. According to Lee et al [6], an implementation of preoperative call log reduced the cancellation from 16.8% to 8.8% during the three month study.

In the medical condition related category, unfit for surgery was the prominent issue which accounted for 14% of cancellations. Al Talalwah et al [12] reported a 42.9% cancellation due to patients not fit for surgery, which was more than doubled compare to our study. In our study, unfit for surgery encompassed the presence of URTI, septic patients, deterioration of condition and any new or correctable medical condition that could significantly affect perioperative outcome. Presence of URTI seemed to be a frequent reason for cancellation in the medical condition related category and the specialities that reported this problem the most were ophthalmology, cardiac cath lab, paediatric surgery and neonates. Other discipline may have had a similar problem, but due to poor documentation, this problem was not revealed. Many patients in the burns theatre were cancelled as a result of being unfit for surgery, this is likely due to patients being septic, critically ill and anaemic not due to URTI.

Bathla et al [4] found the most common reason for cancellation was the presence of URTI at 30.6%. In the Study by Tait et al [10], 34.6% of elective paediatric patients were cancelled due to presence of URTI. Comparing to our study, Bathla et al [4] and Tait et al [10] had rates more than doubled our cancellation rate due to URTI. Although it did not appear to be the main reason for cancellation of the elective paediatric patients in our study possibly due to poor documentation, the presence of URTI is worth looking into because of its association with perioperative respiratory complication and anaesthetic team mostly likely to be involved in the decision to cancel the patient. [20]

Unavailability of post-operative placement accounted for 10.7% of the cancellation of elective paediatric surgeries at CHBAH. Desta et al [7] reported on 5.5% cancellation from unavailability of ICU bed, which is less than our study. The specialities that were mostly affected by this problem were ENT and ortho spine. All cases (100%) that were cancelled in ortho spine were due to unavailability of an ICU bed. Chris Hani Baragwanath Academic Hospital is a tertiary institution where complicated ENT and spine cases requiring speciality and post-operative monitoring are done, with a limited number of ICU beds and high volume of patients, provision of such services is significantly affected. Hospital management and the department of health needs to be informed of this problem and a plan for provision of more

post-operative placement must be made, considering the capacity of the patients catered for by CHBAH.

The reasons for cancellation in our study were due to avoidable factors at 68% and non-avoidable at 32%. This warrants reasons to investigate intensively about cancellation of elective surgery in paediatrics and implement strategies to deal with these unnecessary cancellations due to avoidable factors. The greatest number of avoidable factors were due to time constraint, patient not arriving for surgery, surgery unnecessary and other. There is approximately 70% place for improving theatre efficiency by tackling avoidable factors. Unfit for surgery and unavailability of post-operative placement contributed the most in non-avoidable factors. In the studies by Kaddoum et al [5], Ezike et al [15] and Bekele et al [9], most cancellations were also deemed avoidable.

A new method or strategy for recording information about elective surgeries is necessary to be able to have more detailed and adequate audits. The detailed audit should include starting and finishing times, any delay and reasons for them. The study by Asmal et al [17] showed that time constraint was due to time misuse rather than absolute lack of time. By tackling the time constraint issue, the overall theatre efficiency may improve significantly. A preoperative communication protocol would be of significant help in reducing the cancellation of elective surgery in paediatric patients, especially for patients booked as outpatients. Pre-operative call log and pre-operative assessment clinics could assist in reducing the cancellation of elective paediatric surgery because the presence of URTI or any correctable medical condition could be identified and treated accordingly before the booking, and appropriate health education could be done.[6]

Limitations

The study was done retrospectively which could have impacted on the results because information is gathered from previous records. The records could be insufficient, not detailed and scanty, this affects the audit results. Some disciplines such as MRI, angiography and CT scan were not included in the study due to unavailability of records. Thus, other factors may

have been missed that contribute to the cancellation of elective surgery in paediatric patients at CHBAH.

Conclusion

The rate of cancellation in our study was high but comparable to other African and South African studies. Time constraint was the major reason for cancellation, therefore time constraint analysis and theatre time efficiency needs to be examined further. Majority of the causes for cancellation were avoidable. Multiple preventable factors contributed to the high rate, therefore a more detailed investigation and implementation of improvement strategies to tackle these factors is warranted.

Conflict of interest

The authors declare no conflict of interest.

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Appendix 1: Proposal

An audit of cancellation of elective surgery in paediatric patients at Chris Hani Baragwanath Academic Hospital

Nomdumiso Gamede

A0030809

Supervisor:	Dr Ryan Campbell
	Department of Anaesthesiology
Co-supervisor:	Dr Palesa Mogane
	Department of Anaesthesiology

1. Introduction

The provision of elective surgical services requires significant preparation from a variety of parties including patients, parents, hospital staff and hospital management. It forms a significant part of hospital work load and it is thus important to periodically assess the efficiency of these services (1).

Cancellation of elective cases is one of the quality indicators of theatre operation worldwide (2, 3). Therefore, theatre efficiency and management can be assessed by auditing the cancellation of scheduled elective surgery (2, 3). The incidence of elective surgical cancellation varies between institutions from 1% to 40% (1, 4, 5). There is no real consensus around an acceptable cancellation rate (2, 3).Some literature recommends a rate of less than 5% as acceptable (2, 3). There is wide variation in the reasons for cancellation between hospitals, which is probably due to each institute's unique ethics, culture, staff pattern, demographics and the service it provides (6).

There are numerous factors that may contribute to elective cases being cancelled, including: patient related factors; work-up related factors; surgery related factors; anaesthesia related factors; factors related to medical conditions; and facility or resources related factors (Table 1)(1-9).

Table 1. Factors contributing to cancellation of elective cases

Patient related	• Patient did not arrive • Patient's or guardian's change of mind • Refusal of operation • Pre-operative instruction not followed e.g. patient ate • Consent issues e.g.name change or discrepancy, guardianship
Work-up related	• Medical work up incomplete • Abnormal test results

	• Abnormal results not corrected
Medical conditions related	• Change of medical status • Change of treatment plan • Unfit for surgery e.g. presence of upper respiratory tract infection
Surgery related	• Surgeon not available or ill • Overbooking • Change of surgical plan • Wrong diagnosis or surgery deemed unnecessary
Anaesthesia related	• Anaesthetist not available
Facility or resource related	• Time constrains • No water or electricity • Equipment failure or unavailable • Lack of staff • No post-operative placement available such as ICU bed • Linen and autoclave availability
Other or miscellaneous	• Factors that do not fall into any category

Several studies at different hospitals have been done to try and identify the facility specific causes of cancellation of elective surgery and a variety of recommendations have been suggested based on these results. Chiu et al (3) showed cancellation rates of 7.6%, with the most important contributing factors being facility related (73.0%). Bathla et al (1) found a similar cancellation rate at 7.6%, with the most common reason being the presence of upper respiratory tract infections, which accounted for 30.6% of all cancellations. Jonnalagadda et al (6) reported a 24.0% cancellation rate and majority of the reasons for cancellation were unavailability of a bed in the recovery room (15.0%). In the study by Tait et al (10) 34.6% of elective paediatric patients were cancelled due to presence of an upper respiratory tract infection and 30.7% were cancelled for other medical conditions.

Upper respiratory tract infection is one of the common causes of cancellation in paediatric patients (1, 10). This is due to its association with an increased risk of peri-operative respiratory complications such as laryngospasm, bronchospasm, airway obstruction, stridor and desaturation (10, 11). According to Regli et al (11) a current or recent history of an upper respiratory tract infection will be noted in approximately 25% to 45% of the children presenting for elective surgery. Paediatric patients can be expected to acquire between six to eight episodes of an upper respiratory tract infections per year which contributes significantly to the frequent postponement of elective surgery (11). There are no universally accepted guidelines on deciding whether to proceed with anaesthesia or not in a child with an upper respiratory tract infection. In inexperienced hands, it is more likely that these patient's surgeries will be postponed until the upper respiratory tract infection has resolved or for four to six weeks after the onset of symptoms (11).

Cancellation of elective surgery can have a negative impact for all parties involved. These can include inconvenience and emotional misery to patients and families because of missed work and school days; wasted investigations; logistics of repeating pre-operative preparation; lower staff morale and complacency of the situation(1-6, 8, 10). Cancellation of elective surgery can cause financial burden to patients/parents and medical facility due to extended hospital stay, underutilization of theatre time and delayed patient care potentially leading to increased morbidity and mortality for patients(1-6, 8). Cancellation of elective surgery in paediatric patients is potentially even more significant. The high incidence of upper respiratory tract infections in paediatric patients places them at higher risk for postponement (1, 10). Cancellation increases caregiver's and patient's stress and anxiety. Moreover, there are both medical and ethical concerns in keeping paediatric patients starved unnecessarily for prolonged periods of time (1). It is therefore of the utmost importance to describe the rates and reasons for cancellation of elective surgery so that appropriate measures can be developed and implemented to tackle these issues (2). Minimising cancellations will improve patients care and satisfaction, and reduce costs associated with it (1).

Other institutions have designed protocols in order to reduce cancellation rates based on the contributing factors identified during facility audits (5, 7-9). Protocols include nurse-patient pre-operative call log, pre-operative assessment clinics and weekly reviews of all the rescheduled surgeries by a multidisciplinary team (5, 7-9). An audit of paediatric elective

surgery cancellation at Chris Hani Baragwanath Academic Hospital could help to identify contributing factors and guide policy creation, thereby facilitating better service delivery.

2. Problem statement

The effective functioning of an operating theatre must be assessed on a regular basis. Cancellation of elective surgery is one of the ways that shows poor efficiency in theatre performance (3). Elective surgery postponement is a common problem worldwide and causes numerous detrimental effects on patients and their families, hospital finance and hospital staff (1, 3-10). The rates and reasons for cancellation of elective surgery varies between facilities (1, 4, 5). It is therefore important to describe rates and reasons for cancellation at the Chris Hani Baragwanath Academic Hospital in order to develop and implement plans to tackle this problem. The description of the rates and reasons for cancellation of elective surgery becomes more significant in paediatric patients due to multiple difficulties associated with planning and performing surgery in this population group (1). The cancellation rate for elective paediatric surgery at Chris Hani Baragwanath Academic Hospital is currently unknown and has not been recently audited.

3. Aim

The aim of this study is to determine the rates and describe the reasons for cancellation of elective surgeries in paediatric patients at Chris Hani Baragwanath Academic hospital (CHBAH) from 01 January 2019 to 31 December 2019.

4. Objectives

The primary objectives of this study are to:

- determine the proportion of paediatric elective cases cancelled
- describe the reasons for cancellation of paediatric elective surgeries.

The secondary objectives of this study are to:

- determine and describe common contributing factors to the cancellations of paediatric elective surgeries
- describe avoidable and non-avoidable reasons for cancellation.

5. Research assumptions

The following definitions will be used in the study.

Paediatric patient: is a person from birth to 12 years.

Incomplete records: records without nursing theatre recording slip.

Cancellation: the surgery that is not done on the booked list, either postponed or completely removed from the list.

Patient related factors: Patient did not arrive, consent issues, nil per os pre-operative instruction not followed, refusal of operation and parent or guardian change of mind.

Medical conditions related factors: change of medical status, change of treatment plan and unfit for surgery e.g. presence of URTI.

Work-up related factors: medical work-up incomplete and abnormal test results not acted upon.

Surgery related factors: Surgeon not available, wrong diagnosis or surgery deemed unnecessary and overbooking.

Anaesthesia related factors: Anaesthetist not available

Facility related factors: no water or electricity, no post-operative placement available and equipment failure or unavailable.

Resources related factors: lack of staff, time constrains, linen and autoclave availability.

Avoidable reasons: are the reasons that are judged as potentially avoidable because some intervention or protocol can be implemented to try decrease the cancellation due to these reasons. These include resource related factors, surgery and anaesthesia related factors, patient related factors, work up related factors and other.

Unavoidable reasons: are the reasons are judged as unavoidable because none or minimal can be done to improve them. These include facility related factors and medical condition related factors.

6. Demarcation of study field

The study will be conducted in the theatre complex of the Chris Hani Baragwanath Academic Hospital affiliated to the Department of Anaesthesiology at the University of the

Witwatersrand. The hospital has 29 theatres of which 17 may be used for paediatric elective procedures. Due to the logistics of paediatric record keeping, the study will only focus on the following theatres: paediatric general surgery and neonates, paediatric orthopaedics, spine orthopaedics, St John's ophthalmology, neurosurgery, hands, burns, plastics, urology, ear nose and throat (ENT) and maxillofacial. The following suites will also be included: cardiac catheterisation laboratory, bronchoscopy and audiology.

7. Ethical considerations

The ethical approval to conduct the study will be sought from the Human Research Ethics Committee (Medical) and the Postgraduate Studies Committee of the University of Witwatersrand. Approval will also be sought from the Head of Clinical Anaesthesiology, Medical Advisory Committee, Theatre Matron and Record Gate Keeper at Chris Hani Baragwanath Academic Hospital.

The raw data will only be accessed by the researcher and supervisors. The data collection sheet will be stored securely for at least six years after completion of the study.

The study will be conducted according to the principles of the Declaration of Helsinki 2013 (12) and South African Guidelines for Good Clinical Practice(13).

8. Data collection

8.1 Study design

A retrospective, descriptive study design will be used in this study.

A retrospective study is defined by Brink H et al (14) as a study in which data is collected on an outcome occurring in the present and then linked retrospectively to determinants which occurred in the past. Theatre records from 01 January to 31 December 2019 will be used. Botma et al (15) define a descriptive study as "a nonexperimental design used if the researcher wants to describe the variable of interest as it occurs". This study will describe the rates and reasons for cancellation of paediatric patents based on theatre records.

8.2 Study population

The study population will consist of paediatric theatre records from the following theatres and suites: paediatric general surgery and neonates, paediatric orthopaedics, spine orthopaedics, St John's ophthalmology, neurosurgery, hands, burns, plastics, urology, ear nose and throat (ENT), maxillofacial, cardiac catheterisation laboratory, bronchoscopy and audiology for the 2019 (01 January to 31 December).

8.3 Study sample

8.3.1 Sample method

In this study a convenience, consecutive sampling method will be used. Convenience sampling is one of the non-probability sampling methods, where "any case that happens to cross the researcher's path, nearest and most easily available, just loosely linked to the phenomenon" is a defining characteristics (15). All available complete theatre records from 01 January to 31 December 2019 will be used in this study.

8.3.2 Sample size

The sample size will be determined by the number of the elective paediatric surgeries performed between 01 January 2019 to 31 December 2019.

8.3.3 Inclusion and exclusion criteria

The inclusion criteria for this study are:

- Elective paediatric surgery
- Complete records

The exclusion criteria in this study are:

- Records from theatres where reasons for cancellations are not stated and most likely inaccurate.

8.4 Data collection

Theatre records from 01 January 2019 to 31 December 2019 will be reviewed for elective paediatric surgeries in the theatres involved in the study. From these records, the following information will be sought:

- Theatre name
- Number of cases booked each month
- Number or cases cancelled each month
- Reasons for cancellation (these will be placed in categories, please see data collection sheet in appendix A).

The time allocated for elective surgery is between 07:30 to 16:00 weekdays. Elective paediatric procedures will include all cases appearing on the booked list signed by the consultant anaesthesiologist and theatre matron before 14:00 the day prior to the scheduled surgery. A patient appearing on this list will be considered cancelled if the operation does not take place on the scheduled date. The cases added to an elective list on the day of the surgeries will be excluded as these will be recorded as emergency case bookings.

9. Data analysis

Data will be captured in Microsoft's Excel spreadsheet and analysed with Statistica 12.0. Means and standard deviation will be used to describe continuous normally distributed variables. Median and interquartile ranges will be used for ordinary skewed variables. Results will be expressed as frequencies and percentages.

10. Significance of the study

Cancellation of elective surgery is a common problem that affects theatre efficiency and causes financial burden, distress to patients and families, hospital resource wastage and overall poor care delivery. It is therefore important for each facility to describe the rates and reasons for cancellation of elective surgeries, especially in paediatric patients, for appropriate strategies to be implemented to reduce this problem. This study aims to describe the rates and reasons for cancellation of elective surgery in paediatric patients at CHBAH and suggestions can be made to deal with this problem. This study will help to improve theatre productivity, patient's care and satisfaction.

11. Validity and reliability of the study

Botma et al (15) defines validity and reliability of a study as follows: "validity indicates whether the conclusion of the study are justified based on the design and interpretation" and "reliability represents the consistency of the measure achieved''.

Validity and reliability of the study will be ensured by using an appropriate study design, one researcher will be responsible for all data collection, data will be analysed in consultation with a biostatistician.

12. Potential limitations of the study

This study is a retrospective study where theatre records will be reviewed. Important information may not be adequately documented as it relies on the accuracy and adequacy of written records. The quality of documentation will differ between theatres. The outcome of the study cannot be generalised, it will be specific to CHBAH.

13. Project outline

The table below indicates the time frame for completion of the study.

Activity	Nov - Dec 2019	Jan 2020	Feb-May 2020	Jun-Jul 2020	Aug-Sep 2020	Oct-Nov 2020	Dec 2020	Jan 2021
Proposal	**x**	**x**						
Postgraduate and ethical submission			**x**					
Data collection				**x**				
Data analysis					**x**			
Discussion with supervisors						**x**		
Writing of paper							**x**	
Submission of Mmed								**x**

14. Financial plan

The cost of paper and printing will be covered by Department of Anaesthesiology. The estimation of financial cost is illustrated in the table below:

Item	Price per item	Number of items	Total price
Protocol printing	R1	100	R100
Information letters	R1	10	R10
Data collection sheets	R1	60	R60
Research report	R1	300	R300
Binding	R250	3	R750
Total			R 1220

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Appendix A: Data collection sheets

THEATRE NAME or SPECIALITY	Number of patients booked	Number of patients done	Number of patients cancelled	Cancellation rate
Paeds ortho				
Ortho spine				
Paeds surgery and neonates				
ENT				
Burns				
Plastics				
Neurosurgery				
Ophthalmology				
Cardiac Cath lab				
Bronchoscopy				
Audiology				
Urology				
Hands				
Maxillofacial				
TOTAL				

Reasons for cancellation

Theatre name or number	Patients related	Work-up related	Surgery related	Resources related	Facility related	Medical conditions related	Anaesthetic related	Others or miscellaneous
Paeds ortho								
Ortho Spine								
Paeds surgery and neonate								
ENT								
Burns								
Plastics								
Neurosurgery								
St John's ophthalmology								
Cardiac Catheterisation laboratory								
Bronchoscopy								
Audiology								
Urology								
Hands								
Maxillofacial								
TOTAL								

Other or miscellaneous- any other reasons that do not fall into categories(3, 7).

Reasons for cancellation in each category

Patient related factors	Patient did not arrive	Refusal of operation	Consent issues	Parent or guardian change of mind	Nil per os pre-op instruction not followed
Paeds surgery and neonates					
Paeds ortho					
Ortho spine					
ENT					
Burns					
Plastics					
Neurosurgery					
Ophthalmology					
Cardiac cath lab					
Bronchoscopy					
Audiology					
Urology					
Hands					
Maxillofacial					

Work-up related factors	Medical work-up incomplete	Abnormal test results not corrected
Paeds surgery and neonates		
Paeds ortho		
Ortho spine		
ENT		
Burns		
Plastics		
Neurosurgery		
Ophthalmology		
Cardiac cath lab		
Bronchoscopy		
Audiology		
Urology		
Hands		
Maxillofacial		

Medical condition related factors	Change of medical condition	Change of treatment plan	Unfit for surgery e.g. presence of URTI
Paeds surgery and neonates			
Paeds ortho			
Ortho spine			
ENT			
Burns			
Plastics			
Neurosurgery			
Ophthalmology			
Cardiac cath lab			
Bronchoscopy			
Audiology			
Urology			
Hands			
Maxillofacial			

Surgery related factors	Surgeon unavailable	Wrong diagnosis or surgery deemed unnecessary
Paeds surgery and neonates		
Paeds ortho		
Ortho spine		
ENT		
Burns		
Plastics		
Neurosurgery		
Ophthalmology		
Cardiac cath lab		
Bronchoscopy		
Audiology		
Urology		
Hands		
Maxillofacial		

Anaesthesia related factors	Anaesthetist unavailable
Paeds surgery and neonates	
Paeds ortho	
Ortho spine	
ENT	
Burns	
Plastics	
Ophthalmology	
Cardiac cath lab	
Bronchoscopy	
Audiology	
Urology	
Hands	
Maxillofacial	

Facility related factors	No water or electricity	No post op placement place e.g. ICU	Equipment failure or availability
Paeds surgery and neonates			
Paeds ortho			
Ortho spine			
ENT			
Burns			
Plastics			
Neurosurgery			
Ophthalmology			
Cardiac cath lab			
Bronchoscopy			
Audiology			
Urology			
Hands			
Maxillofacial			

Resource related factors	Time constraint	Lack of staff	Linen and autoclave availability
Paeds surgery and neonate			
Paeds ortho			
Ortho spine			
ENT			
Burns			
Plastics			
Neurosurgery			
Ophthalmology			
Cardiac cath lab			
Bronchoscopy			
Audiology			
Urology			
Hands			
Maxillofacial			

Other or miscellaneous factors	Back up patients	Done in other theatre
Paeds surgery and neonates		
Paeds ortho		
Ortho spine		
ENT		
Burns		
Plastics		
Neurosurgery		
Ophthalmology		
Cardiac cath lab		
Bronchoscopy		
Audiology		
Urology		
Hands		
Maxillofacial		

Appendix 2: Human Research Ethics Committee clearance certificate

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

Office of the Deputy Vice-Chancellor (Research & Post Graduate Affairs)

TO: Dr IN Gamede
School of Clinical Medicine
Department of Anaesthesia
Medical School
University

E-mail: ndumigamede@gmail.com

CC: Supervisor: Drs R Campbell and P Mogane
<ryancampbell693@yahoo.cpom>
and <HREC-Medical.ResearchOffice@wits.ac.za>

FROM: Iain Burns
Human Research Ethics Committee (Medical)
Tel: 011 717 1252

E-mail: Iain.Burns@wits.ac.za

DATE: 2020/06/18

REF: *R14/49*

PROTOCOL NO: **M200347** *(This is your ethics application study reference number. Please quote this reference number in all correspondence relating to this study)*

PROJECT TITLE: *Audit of cancellation of elective surgery in paediatric patients at Chris Hani Baragwanath Acadmic Hospital*

Please find attached the Clearance Certificate for the above project. I hope it goes well and that an article in a recognized publication comes out of it. This will reflect well on your professional standing and contribute to the Government funding of the University.

MSWorks2000/Iain0007/Clearscan.wps

UNIVERSITY OF THE
WITWATERSRAND,
JOHANNESBURG

R14/49 Dr IN Gamede

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M200347

NAME: (Principal Investigator) — Dr IN Gamede

DEPARTMENT: — School of Clinical Medicine
Department of Anaesthesia
Medical School
University

PROJECT TITLE: — Audit of cancellation of elective surgery in paediatric patients at Chris Hani Baragwanath Acadmic Hospital

DATE CONSIDERED: — 27/03/2020

DECISION: — Approved unconditionally

CONDITIONS:

SUPERVISOR: — Drs R Campbell and P Mogane

APPROVED BY: — Dr CB Penny, Chairperson, HREC (Medical)

DATE OF APPROVAL: — 2020/06/18

This clearance certificate is valid for 5 years from the date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the 3rd Floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.
I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **March** and will therefore reports and re-certification will be due early in the month of **March** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature — Date

Appendix 3: CHBAH Medical Advisory Committee Approval

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

MEDICAL ADVISORY COMMITTEE

CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL

PERMISSION TO CONDUCT RESEARCH

Date: 6th May 2020

TITLE OF PROJECT:

An Audit of Cancellation of Elective Surgery in Paediatric Patients at Chris Hani Baragwanath Academic Hospital

UNIVERSITY: Witwatersrand

Principal Investigator: Dr N Gamede

Department: Anaesthesia

Supervisor : Dr R Campbell

Permission Head Department (where research conducted): Yes

The Medical Advisory Committee recommends that the said research be conducted at Chris Hani Baragwanath Academic Hospital. The CEO / management of Chris Hani Baragwanath Academic Hospital is accordingly informed and the study is subject to:-

- **Permission having been granted by the Committee for Research on Human Subjects of the University of the Witwatersrand.**
- The Hospital will not incur extra costs as a result of the research being conducted on its patients within the hospital
- The MAC will be informed of any serious adverse events as soon as they occur
- Permission is granted for the duration of the Ethics Committee Approval.

Recommended
(On behalf of the MAC)
Date: 6/5/2020

Approved/~~Not Approved~~
Hospital Management
Date: 07/05/2020

Appendix 4: Permission letter by Theatre Matron

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL
DIRECTORATE - ANAESTHESIA
Enquiries: Dr P. Mogane
Tel. number: (011) 933-9334
Email: Palesa.Mogane@wits.ac.za

Department of Anaesthesiology
Chris Hani Baragwanath Academic Hospital
PO Bertsham
2013
14th May 2020

To whom it may concern

RE: PERMISSION TO CONDUCT RESEARCH

This serves to confirm that I grant permission for Dr Gamede to conduct research which involves accessing theatre records and cancellation reports at the Chris Hani Baragwanath Academic Hospital theatre complex. The research topic is titled: An audit of the cancellation of elective surgery in paediatric patients at Chris Hani Baragwanath Academic Hospital.

I'd like to wish her luck in this endeavor and I am happy to support her wherever possible.

Kind regards.

Mrs Vicky Khangale
Theatre complex matron
JD Allen theatre
Victoria.khangale@gauteng.gov.za

Appendix 5: Permission letter by CHBAH Anaesthesiology Head of Department



GAUTENG PROVINCE

REPUBLIC OF SOUTH AFRICA



CHRIS HANI BARAGWANATH ACADEMIC HOSPITAL
DIRECTORATE - ANAESTHESIA
Enquiries: Dr P. Mogane
Tel. number: (011) 933-9334
Email: Palesa.Mogane@wits.ac.za

Department of Anaesthesiology
Chris Hani Baragwanath Academic Hospital
PO Bertsham
2013
29th April 2020

To whom it may concern

RE: PERMISSION TO CONDUCT RESEARCH

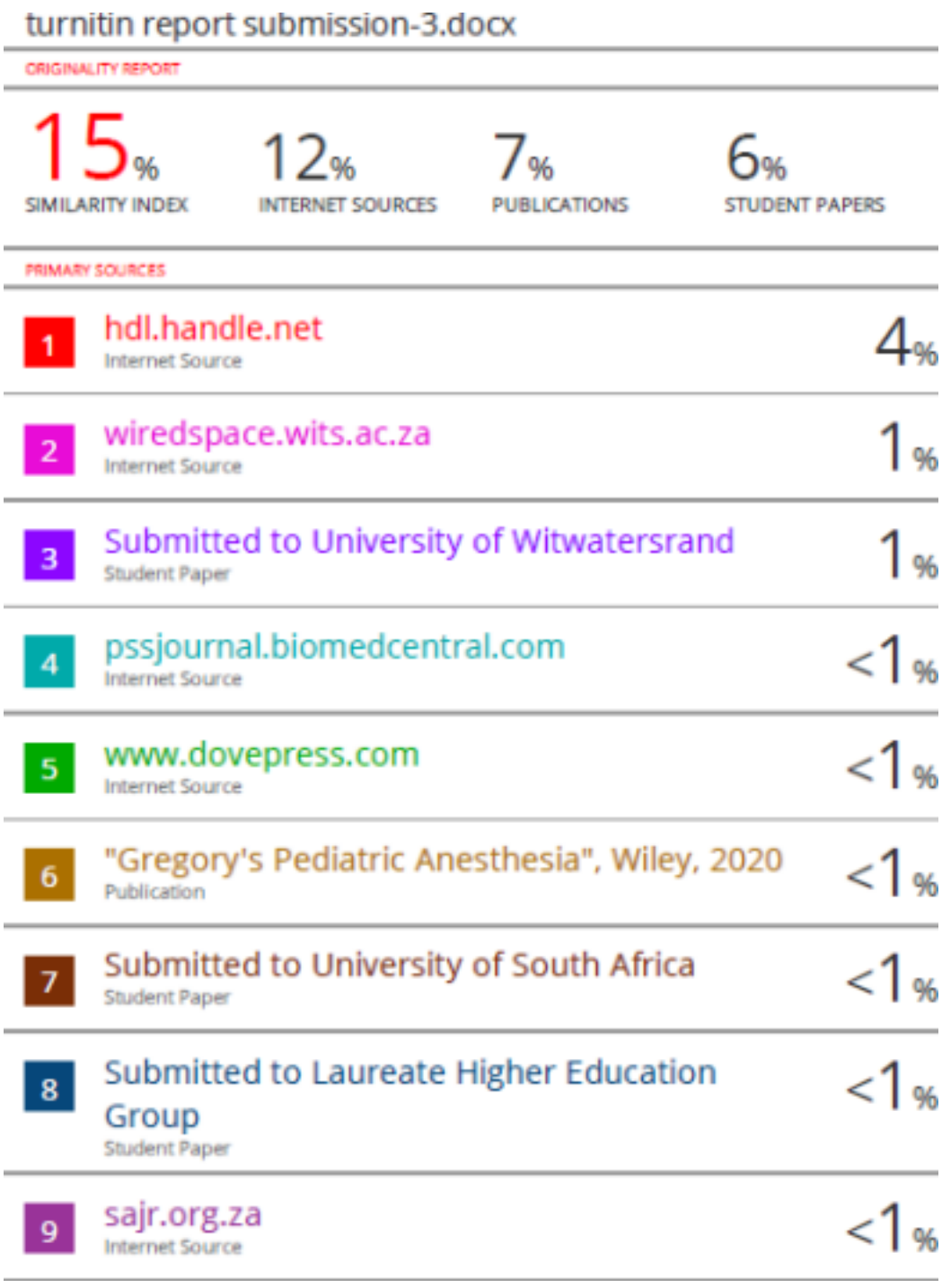
This serves to confirm that I grant permission for Dr N Gamede to conduct research involving the Department of Anaesthesia at the Chris Hani Baragwanath Academic Hospital. The research topic is titled: An audit of cancellation of elective surgery in paediatric patients at Chris Hani Baragwanath Academic Hospital.

I'd like to wish her luck in this endeavor and I am happy to support her wherever possible.

Kind regards.

Dr Palesa Mogane
Chief specialist and Head of Department
Department of Anaesthesiology
Chris Hani Baragwanath Academic Hospital
University of Witwatersrand
Email:

Appendix 6: Plagiarism/ Turnitin report cover page



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Appendix 7: Journal guidelines to authors

Southern African Journal of Anaesthesia and Analgesia
(http://www.sajaa.co.za/index.php/sajaa/about/submissions)

Submitted manuscripts that are not in the correct format and without the required supporting documentation specified in these guidelines will be returned to the author(s) for correction and will delay publication.

Authorship

Named authors must consent to publication by signing a covering letter which should be submitted as a supplementary file. Authorship should be based on substantial contribution to:

(i) conception, design, analysis and interpretation of data;

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