

An observational cross-sectional study to assess teaching, knowledge and resource availability to provide surgical burn care by surgical trainees in hospitals in KwaZulu-Natal, South Africa

N Mabaso,¹ MTD Smith,²  NL Allorto² 

¹ Department of General Surgery, Harry Gwala Regional Hospital, South Africa

² Department of Anaesthetics, Greys Hospital, University of KwaZulu-Natal, South Africa

Corresponding author, email: varunthirayan@gmail.com

Background: Surgical management of burn injuries is within the scope of practice of general surgeons in most low- and middle-income countries (LMICs), like South Africa. This study aims to assess the teaching, knowledge and resource availability to perform basic surgical procedures for burn injuries amongst surgical trainees in KwaZulu-Natal.

Methods: The study design is an observational descriptive cross-sectional study using quantitative questionnaires, including registrars in the Department of Surgery at the University of KwaZulu-Natal

Results: There was a response rate of 57%. The hospitals have been grouped into regions of coastal, western and northern to reflect the three areas where surgical registrars receive their training. There was a large range of clinical and surgical skill teaching between regions. Equipment and operating time availability is more available in the west and north than in the coastal regions, which is reflected in the reported practical experience. Acute indications for surgery were better understood than those for chronic burns.

Conclusion: The surgical capacity in general surgery in KwaZulu-Natal to meet the burden of injury for burns is deficient. While some theoretical knowledge exists, the practical component is insufficient, which could be due to a lack of equipment and training. In order to address the burden of burn injury in KwaZulu-Natal, a provincial plan needs to be developed. Access to equipment and theatre should be prioritised and practical skills training should be developed with reinforcement of theoretical knowledge as part of a training strategy for general surgical registrars.

Keywords: burns, education, skills training

Introduction

The definitive treatment for a deep burn injury is excision and skin grafting using simple equipment such as the Humby knife and electric dermatome.^{1,2} These are techniques established a century ago and are the mainstay of surgical care for burns. The multidisciplinary team (MDT) has more recently become a recognised component of care, with involvement of a dietician, occupational therapist and physiotherapist essential for improved outcomes.³ In KwaZulu-Natal, the burden of burn injury is difficult to estimate, with previous publication estimates ranging from 7 000–30 000 admissions.⁴ Within the provincial Department of Health, there is a single burn unit at Inkosi Albert Luthuli Hospital. Most burn-injured patients requiring surgery are therefore managed in district and regional or tertiary hospitals by general surgeons. A paper published by the Luthuli unit stated that 44% of adults and 30% of children were inappropriately referred from a specialist surgical unit. The authors clearly state that “burn care should for the time being remain part of the armamentarium of the general surgeon, and it should therefore be imperative that any surgeon

training for a career in Africa spends time in a burn unit to be taught the skills of burn care, including tangential excision and skin grafting.”⁴ The aim of this study is to quantify the current access to training and basic equipment available to surgical trainees who are placed in regional hospitals around the province. This will aid in understanding the current resource capacity to perform basic surgical procedures for burn injuries in KwaZulu-Natal, as well as assess the current level of knowledge in surgical concepts around burn injuries requiring surgery. The findings will inform future training programmes as well highlight challenges in training surgeons in burn management in KwaZulu-Natal.

Methods

The study design is an observational descriptive cross-sectional one, using quantitative questionnaires, with the aim to include all registrars (51) in the Department of Surgery at the University of KwaZulu-Natal. This included registrars working in Durban and Pietermaritzburg as well as those rotating through remote sites such as Empangeni. Surgical specialists, medical officers and interns were excluded.

Data collection methods and tools

Questionnaire 1 was designed as clinical questions and tested for adequacy and appropriateness by senior trauma consultants in the department (Appendix 1). Questionnaire 2 was designed as Likert scales on the training exposure and the surgical equipment available for basic burn surgery available at each hospital (Appendix 2). Each registrar submitted an answer for each hospital they had rotated through. ‘Not applicable’ was applied if the registrar had not rotated through the hospital and therefore could not evaluate the institution. Questionnaires were converted to an electronic platform for distribution via email. Email addresses were obtained from the Department of Surgery at the University of KwaZulu-Natal. The email included an introduction that outlined the purpose and importance of the study and clear instructions on how to complete the questionnaire; all replies were anonymised. The data obtained from the surveys was manually entered into an Excel master spreadsheet and managed as a “one-to-one” database to ensure data integrity and to ensure security of confidential information.

Data analysis techniques

Current knowledge will be assessed using a single-best-answer format consisting of ten questions with five answers each. The answers are expressed using percentage correct in each category. Where a Likert scale was used, the proportion of answers in each scale was illustrated in a table. The hospitals have been grouped into regions of coastal, western, and northern to reflect the three areas where surgical registrars receive their training as well as for a more meaningful summary of results. Hospitals in the coastal areas include Addington, RK Khan, King Edward, Prince Mshiyeni, Mahatma Gandhi, and Inkosi Albert Luthuli Central Hospital. Hospitals in the western region include Harry Gwala Regional and Greys Hospitals. Ngwelezana Hospital is the only hospital in the north.

Results

Twenty-nine of the 51 questionnaires (57%) were returned. The denominators used were calculated on total responses after exclusion of the non-applicable answers, as these reflected respondents who had not rotated in that hospital. The hospitals have been grouped into regions as mentioned above.

Teaching

The spectrum of answers is presented in Table Ia and Ib.

Northern areas

Tutorials are given frequently and sometimes almost 80% of the time. Bedside teaching is frequent and sometimes 70% of the time. Respondents agreed and strongly agreed that debridement for burns is taught by consultants 56% of the time and 50% agreed and strongly agreed that skin grafting is taught by consultants.

Western areas

Tutorials are given frequently and sometimes almost 80% of the time. Bedside teaching is frequent and sometimes 95% of the time. Respondents agreed and strongly agreed that debridement for burns is taught by consultants 94% of the time and 94% agreed and strongly agreed that skin grafting is taught by consultants.

Coastal areas

Tutorials are given sometimes 50% of the time with 50% hardly and never. Bedside teaching is frequent and sometimes 50% of the time. Eighty-six per cent of respondents disagreed and strongly disagreed that debridement for burns is taught by consultants and almost 90% of respondents disagreed and strongly disagreed that skin grafting is taught by consultants.

Equipment and theatre time

The spectrum of answers is presented in Table II.

Table Ia: Teaching frequency (% of answers in each scale)

Format	Region	Frequently	Sometimes	Hardly	Never	Total responses	Not applicable
Tutorials	Coastal	0	49	27	24	51	94
	Western	50	33	17	0	18	11
	Northern	30	50	10	10	10	19
Bedside teaching	Coastal	20	29	45	6	49	96
	Western	78	17	5	0	18	11
	Northern	45	22	33	0	9	20

Table Ib: Surgical skills teaching frequency (% of answers in each scale)

Operation taught	Region	Strongly agree	Agree	Disagree	Strongly disagree	Total responses	Not applicable
Debridement	Coastal	7	7	46	40	46	99
	Western	82	12	0	6	17	12
	Northern	34	22	22	22	9	20
Skin grafting	Coastal	6	6	53	35	51	94
	Western	88	6	0	6	17	12
	Northern	20	30	30	2	10	19

Table II: Equipment and theatre time availability (% of answers in each scale)

Equipment or operative slate type	Region	Frequently	Sometimes	Hardly	Never	Total responses	Not applicable
Humby availability	Coastal	20	48	21	11	44	101
	Western	88	6	6	0	17	12
	Northern	78	11	11	0	9	20
Dermatome availability	Coastal	11	39	34	16	44	101
	Western	82	12	6	0	17	12
	Northern	56	22	22	0	9	20
Mesher availability	Coastal	21	38	24	17	47	98
	Western	82	12	6	0	17	12
	Northern	67	22	11	0	9	20
Elective slate time	Coastal	11	32	31	26	47	98
	Western	82	6	12	0	17	12
	Northern	67	22	11	0	9	20
Emergency slate time	Coastal	33	39	24	4	49	96
	Western	35	41	6	18	17	12
	Northern	33	56	11	0	9	20

Northern areas

A Humby knife was frequently and sometimes available 89% of the time, a dermatome 78% and a skin mesher 89% of the time. Surgical time was considered available on elective slates and on emergency slates by 89% of respondents.

Western areas

Humby, dermatome and mesher were frequently and sometimes available 94% of the time for each piece of equipment. Surgical time was considered available on elective slates by 88% of respondents and on emergency slates by 76% of respondents.

Coastal areas

A Humby knife was frequently and sometimes available 68% of the time, a dermatome 50% and a skin mesher 60% of the time. Surgical time was considered available on elective slates by 43% of respondents and on emergency slates by 72% of respondents.

Practical experience

The spectrum of answers is presented in Table III.

Northern areas

Sixty per cent of respondents have done more than 10 with 40% having done more than 20 debridements, and 16% and

34% having done more than 10 and more than 20 skin grafts respectively.

Western areas

Seventy-two per cent of respondents have done more than 10 with 33% having done more than 20 debridements, and 26% and 42% having done more than 10 and more than 20 skin grafts respectively

Coastal areas

Forty-six per cent of respondents have done no debridements, and 70% have done no skin grafts, with only 11 having done more than 10 of each of these operations.

Clinical questionnaire

Ninety-six per cent of respondents recognised the need for surgery in an acute full-thickness hand burn and 89% in the acute larger total body surface area (TBSA) burn, where staged surgery was indicated.

In the four questions around chronic granulating burns, only 55%, 69%, 69% and 66% recognised the need for skin grafting. Ninety per cent recognised that wound closure must occur before contracture release, also in the chronic burn. In the perioperative management question, 72% understood that a restrictive transfusion strategy is appropriate in burns. For the two questions on scar management, 86% and 69% understood that scar management is a component of care

Table III: Performance of surgery for burns (% of answers in each scale)

Operation performed	Region	None	< 5	< 10	10–20	> 20	Total responses	Not applicable
Debridement	Coastal	46	30	13	4	7	46	99
	Western	11	11	6	39	33	18	11
	Northern	30	0	10	20	40	10	19
Skin grafting	Coastal	70	8	11	0	11	54	91
	Western	16	11	5	26	42	19	10
	Northern	42	0	8	16	34	12	17

Table IV: Answers to clinical questions and concept tested

Question	% correct answers	Concept tested
1	96.6	Recognition of a full-thickness burn, hand requires early intervention
2	55.2	Granulation tissue indicates a deep wound that requires skin grafting
3	69	Non-healing burns after 21 days require skin grafting
4	89.7	Large full-thickness burns require stages surgery in our setting
5	69	Granulation tissue indicates a deep wound that requires skin grafting
6	72.4	Restrictive transfusion strategies are appropriate in burns
7	65.5	Burn wounds are never sterile
8	89.7	Burn wounds require healing before contractures can be addressed
9	86.2	Care does not end after healing; scar management remains responsibility of the surgeon
10	69	Care does not end after healing; scar management remains responsibility of the surgeon

and requires follow-up by the surgeon and occupational therapist. Table IV summarises the concepts tested by each question and the percentage of correct answers. The questions with percentage answers for each option are presented in Appendix 1.

Discussion

The need for development of surgical care in low- to middle-income countries (LMICs) has become a global priority, however dramatic deficiencies remain in infrastructure, equipment availability and training.⁵ Reasons for lack of surgical equipment availability cited by other authors include initial cost and lack of repair capabilities, lack of disposables and training on the equipment, with water and electricity availability less commonly reported.⁶ In terms of burn care, hospitals appear better equipped to handle initial resuscitation but face gaps preventing the delivery of more comprehensive care including surgery.⁷ Minimal data exists from KwaZulu-Natal on surgical capacity in general, other than a publication on functional operating theatres in South Africa, which shows a total of 183 functional operating theatres in the public healthcare sector of KwaZulu-Natal, equating to 1.96 per 100 000 population.⁸ Local evidence suggests that, with regard to burn injuries, the lack of training and skills development as well as difficult working environments (lack of resources) are deterrents for working in the field.⁹

These issues are supported by the findings of this questionnaire. There is a deficiency in teaching both at the bedside as well as the skills of debridement and grafting. Despite this, the theoretical knowledge regarding concepts in surgery for burns was better than expected. The largest gap in knowledge was understanding that granulating wounds require skin grafting which probably indicates that this is largely not being performed and the registrar therefore lacks exposure to the correct definitive care. Lack of availability of basic equipment needed for burn surgery as well as available operating time would obviously limit the number and nature of surgeries that can be performed for burns. This is supported by the low numbers of operations performed by most respondents which is reflected in the high referral rate to the burn centre at Luthuli. Where the equipment is more available, the numbers of procedures performed by the registrars increase.

The capacity in general surgery in KwaZulu-Natal to meet the burden of injury for burns is deficient. While some theoretical knowledge exists, the practical component is insufficient, which could be due to lack of equipment. It is

difficult to understand why there is limited equipment in our setting. The Humby knife cost is approximately R15 000, electric Davies Dermatome is in the region of R50 000 and a skin mesher in the region of R100 000–150 000. This equipment is sterilised and can be used for hundreds of cases. The disposables are blades. In contrast to the cost of laparoscopic single-use equipment or orthopaedic internal or external fixation, it is difficult to understand why equipment for burn surgery is not available.

The predominant limitation of this paper is the low response rate; however, the paper has highlighted many challenges faced in surgical training for burns.

Conclusion

There is a deficiency in teaching both at the bedside as well as the skills of debridement and grafting. Lack of availability of basic equipment needed for burn surgery and availability of operating time are contributors to this. The burden of burn injury in KwaZulu-Natal is not insignificant, and a provincial plan needs to be developed. General surgeons are required to have the skills for surgical burn care according to the curriculum of the Surgical Colleges of South Africa. Access to equipment and theatre should be prioritised by the Department of Health, with theoretical knowledge and practical skills training developed as a compulsory part of registrar training.

Conflict of interest

All authors declare no conflict of interest.

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Ethical approval

Ethical approval was given by the University of KwaZulu-Natal Research Ethics Committee, BREC/00001722/2020.

ORCID

MTD Smith  <https://orcid.org/0000-0002-6954-153X>

NL Allorto  <https://orcid.org/0000-0001-9339-4640>

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Appendices available online
