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

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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
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>
<thead>
<tr>
<th>Table Ia: Teaching frequency (% of answers in each scale)</th>
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<tr>
<td><strong>Format</strong></td>
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<tr>
<td>Tutorials</td>
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<td></td>
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<tr>
<td>Bedside teaching</td>
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<table>
<thead>
<tr>
<th>Table Ib: Surgical skills teaching frequency (% of answers in each scale)</th>
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<tbody>
<tr>
<td><strong>Operation taught</strong></td>
</tr>
<tr>
<td>Debridement</td>
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<td></td>
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<td></td>
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<tr>
<td>Skin grafting</td>
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</table>
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 and 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 and emergency slates by 88% 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 and 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.
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. 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. 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. 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. 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.

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 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.

Funding source

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Ethical approval

Ethical approval was given by the University of KwaZulu-Natal Research Ethics Committee, BREC/0001722/2020.

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REFERENCES


Table IV: Answers to clinical questions and concept tested

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


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Appendices available online