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Admission factors associated with the in-hospital mortality of burns patients in resource-constrained settings: A two-year retrospective investigation in a South African adult burns centre

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ABSTRACT

Objective: Little is known concerning the factors associated with in-hospital mortality of trauma patients in resource-constrained settings, not least in burns centres. We investigated this question in the adult burns centre at Tygerberg Hospital in Cape Town. We further assessed whether the Abbreviated Burn Severity Index (ABSI) is an accurate predictive score of mortality in this setting.

Methods: Medical records of all patients admitted with fresh burns over a two-year period (2015 and 2016) were scrutinized to obtain data on patient, injury and admission-related characteristics. Association with in-hospital mortality was investigated for flame burns using logistic regressions and expressed as odds ratios (ORs). The mortality prediction of the ABSI score was assessed using sensitivity and specificity analyses.

Results: Overall the in-hospital mortality was 20.4%. For the 263 flame burns, while crude ORs suggested gender, burn depth, burn size, inhalation injury, and referral status were all individually significantly associated with mortality, only the association with female gender, not being referred and burn size remained significant after adjustments (adjusted ORs = 3.79, 2.86 and 1.11 (per percentage increase in size) respectively). For the ABSI score, sensitivity and specificity were 84% and 86% respectively.

Conclusion: In this specialised centre, mortality occurs in one in five patients. It is associated with a few clinical parameters, and can be predicted using the ABSI score.

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1. Introduction

In-hospital mortality is considered a quality indicator of healthcare services [1] and is instrumental to the planning and optimisation of resources [2]. However, many factors influence the level of in-hospital mortality; not only those related to the provision of care, but also the severity of the condition at admission and other pre-existing conditions [3,4]. This is definitely the case for injury care where severity levels and health status at admission vary markedly both between and within countries [5]. Studies on burns demonstrate that in-hospital mortality in specialised centres is much higher in low- and middle-income countries (LMICs) than in high-income countries (HICs), with variations from 55% in India [6] and 27% in Malawi [7] to 3% in the United States or the Netherlands [8,9]. In fact, in LMICs, the imbalance between the limited number of burns centres, their capacity, and the high number of severe burn injuries is difficult to manage, and priorities for admission need to be set. To triage patients for admission, some procedures may be applied such as referral criteria, examples of which are found in different countries [10–12], or mortality prediction scores such as the Abbreviated Burn Severity Index (ABSI) score [13], the Baux score [14], or the Belgian Outcome in Burn Injury (BOBI) score [15–18].

In the Western Cape province of South Africa– the context of the current study– those working at lower levels of care struggled to transfer patients with reports indicating that only 13% of patients were being referred to higher level facilities [19]. This led to the establishment of a list of seven referral criteria to assist with triage and transfer decisions to the burns centres [20]. These criteria encompass well-established mortality predictors like patient's age, injury's total body surface area (TBSA), or inhalation injury [18], as well as some factors that might influence the incidence of complications such as the presence of comorbidity, or the suspicion of non-accidental injuries (see Supplementary Fig. 1) [20]. Whereas a high rate of adherence to the referral criteria has been identified at the province's paediatric burns centre [21], the level of adherence at the provincial's single adult burns centre is still undetermined.

While mortality levels at the adult burns centre were estimated at about 25% during the period 2003–2008 [22], a report for 2011–2013 points to a level of 12% [23]. The reasons for this reduction are unclear, and we don't know if the reduction was maintained in recent years. In addition, to date, there has not been any investigation of the factors that actually influence mortality at the centre. This information could assist in the difficult decisions that need to be made at the time of triage [24]. Even an investigation of the level of precision that can be achieved by established mortality predictors, although developed in HICs, will be helpful in day-to-day decision making. For example, the ABSI score (first described by two American burns centres in 1982 [13]) had its accuracy confirmed in a Swiss burns centre [25] and in a Ghanaian burns intensive care unit [26], but is not widely used in South Africa: it was recently discussed in a South African burns unit that only accepts moderately severe (TBSA $<$ 40%) cases [27].

This study is an attempt to help fill these knowledge gaps. It is concerned with the in-hospital mortality situation at the provincial adult burns centre in recent years. It assesses the level of in-hospital mortality and aims to identify the factors that are most significantly associated with it. An additional aim is to evaluate whether the ABSI score provides accurate results for this patient group so that it could be used as a source of triage.

2. Material and methods

2.1. Study design

This was a medical records-based cross-sectional study of acute burns patients admitted to the Tygerberg Hospital's burns centre.

2.2. Setting

The provincial adult burns centre is located at Tygerberg Hospital, the larger of the two adult tertiary hospitals in the Western Cape. The burns centre has 22 beds, of which six are in the intensive care unit (ICU). It has a very large catchment area: all of the Western Cape province, the population of which is growing steadily, increasing by 39% from 2001 to 2016 [28] and is currently over 6.2 million inhabitants [29]. Over one quarter of the population are migrants from neighbouring provinces and countries [30], mostly represented in the 21% of the population who live in townships' informal dwellings in the province [29]. The living environment in these townships is strongly associated with a higher risk of burn injury due to the precarious and crowded conditions, and the use of open flames for cooking, heating and lighting [31].

2.3. Case definition

All adult cases admitted to the burns centre at Tygerberg Hospital in 2015 and 2016 were considered for inclusion. Children aged 13 years and older are treated as adults in this medical care setting. However, one patient turned out to be 12 years at admission and was nevertheless included in the study. A total of 489 cases were identified from the centre's admission books and sought in the medical archives. Fig. 1 presents the flowchart of cases included and excluded for the data analyses. 19 cases could either not be identified, or had missing or incomplete files. Exclusion criteria were patients who had no sign of ever being admitted to the centre in their files, those who were admitted with an old burn (over 1-week post-burn), those who were readmitted, and those who were admitted solely for palliative care. A total of 372 cases were included.

2.4. Data collection

Individual patient record numbers were used to retrieve patient files from the hospital's online medical records archive. A standardised case report form was used to capture data on patient (age, gender, previous medical history), burn (date and time of injury, mechanism, intent, inhalation, size, depth, anatomical part injured), referral (referral path, referral hospital), adherence to the local referral criteria (7 criteria, listed in Supplementary Fig. 1) and hospital stay (admission to the ICU, length of stay, treatment, discharge and mortality). Concerning the ABSI score of each patient, it was calculated using the initial five categorical risk-factors defined in the original publication by Tobiasen and Hiebert

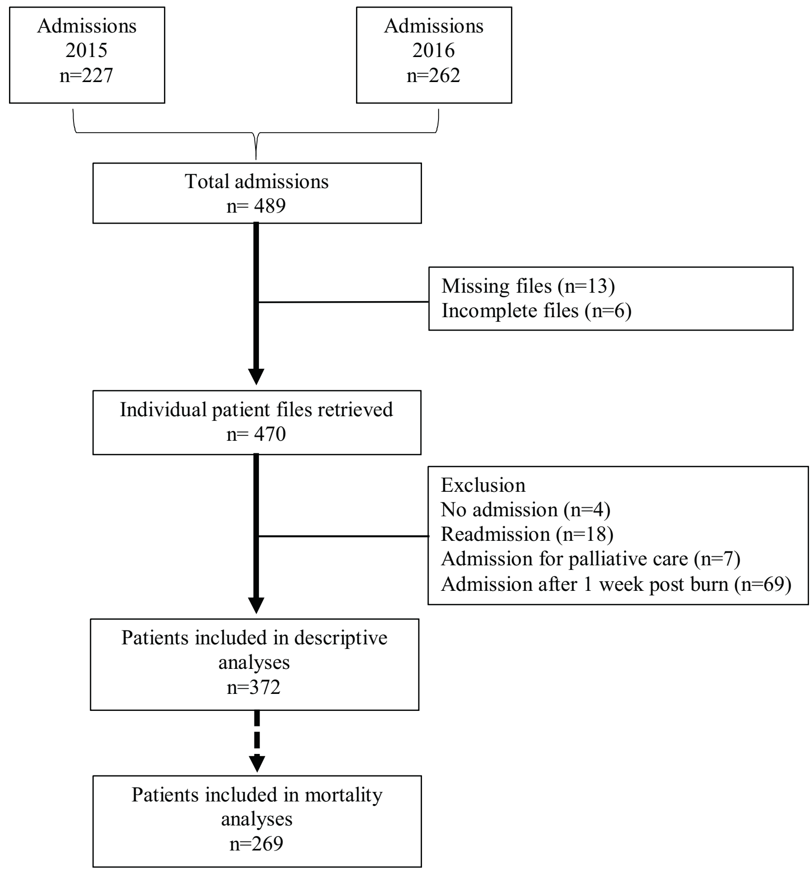

Fig. 1 – Flowchart of patients identified at Tygerberg Hospital burns centre in 2015 and 2016, those excluded and those included in the study population.

[13]. These include: age (1 point for every 20-year increase in age), gender (1 point for female gender), burn depth (1 point for presence of a full thickness burn), inhalation (1 point for presence of inhalation injury), and size (1 point for every 10% TBSA increase). The total score ranges from 2 to 18 points, and is split into six risk categories to identify the probability of mortality [13]. As this is the score currently in use anecdotally at the centre for prognostic purposes, the score was recorded for each patient, either by using the one specified in the doctor's notes, or by calculating it based on the available information.

2.5. *Data analyses*

All cases meeting the inclusion criteria were included in the descriptive analyses (n = 372). However, since 73 of the 76 fatalities were due to flame burns, focus was placed on these cases (n = 263) to investigate the characteristics (patient, injury, and admission-related) influencing in-hospital mortality. Univariate logistic regressions were performed and expressed the associations in terms of odds ratios (ORs) with 95% confidence intervals (CIs). Patient characteristics included gender (male/female) and age (4 categories; 12–20, 21–40, 41–60 and 61–90 years); injury characteristics included depth (three categories based on the need for grafting: superficial and mid-partial thickness, deep partial and full thickness, and those with no depth information), size ((TBSA) expressed in percentage burnt used as a continuous variable), inhalation injury (yes/no), comorbidity (as defined in the referral criterion (see Supplementary Fig. 1) yes/no) and intent (intentional yes/no); admission-related characteristics included time to admission (2 categories: 0–1, and 2–7 days), referral status (referred yes/no), and level of referral hospital (2 categories: clinic, and hospital).

Secondly, we performed multivariate logistic regressions to determine those characteristics that remained associated with in-hospital mortality after controlling for all others.

Using first, all patients, and then, those for flame burns only, mortality rates were obtained for each ABSI score and were compared to those established previously by Tobiasen and Hiebert [13]. Then, using the previously defined cut-off of an ABSI score of 8 as an estimation of 50% mortality rate, sensitivity and specificity were calculated for our sample.

Stata/SE 15.0 for Mac was used for all statistical analyses.

2.6. *Ethical approval*

The study was approved by the Human Research Ethics Committee at Stellenbosch University (#N16/10/125) prior to data collection.

3. Results

Fig. 2 presents the age and gender distribution of the 372 patients admitted at the centre during the study period.

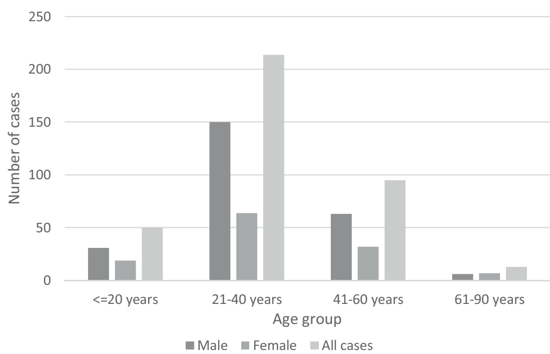

Fig. 2 – Age-related distribution of the patients admitted to Tygerberg Hospital in 2015 and 2016 overall and by gender (n = 372).

Overall, over two thirds were male (67.2%) and their mean age at admission was 34 years (IQR = 25–43) (Fig. 2).

Almost three quarters of the cases were due to flame burns (71%), of which 36% were sustained in shack fires. Other mechanisms included hot liquid (19%), electrical (4%), chemical (3%), and hot object (1%); 1% had no information. The characteristics of the injuries are presented in Table 1, all cases aggregated and split between flame burns and other mechanisms. While one quarter of all cases were registered as intentional, most injuries were severe as exemplified by 41% being of full thickness (48% for the flame burns) and 40% having a TBSA higher than 30%. There was also a high rate of cases with inhalation injury (47%). Several patients had comorbidities (27%), including 12% with known HIV.

Table 2 presents the patients' admission-related and treatment characteristics. 79% of the patients lived in an

Table 1 – Description of the injury characteristics of the patients admitted in 2015 and 2016, all patients aggregated by burn mechanism.

Injury characteristics	Total (n = 372)		Flame (n = 263)		All others (n = 109)	
	N	%	N	%	N	%
Burn depth						
Superficial partial	24	6.5	14	5.3	10	9.2
Mid partial/indeterminate	106	28.5	59	22.4	47	43.1
Deep partial	53	14.3	38	14.5	15	13.8
Full	152	40.9	126	47.9	26	23.9
No information	37	10.0	26	9.9	11	10.1
TBSA[a] (in %)						
≤10	94	25.3	46	17.5	48	44.0
11–20	88	23.7	59	22.4	29	26.6
21–30	76	20.4	58	22.1	18	16.5
31–50	73	19.6	59	22.4	14	12.8
>50	41	11.0	41	15.6	0	0.0
Anatomical site[b]						
Head, face and neck	259	69.6	195	74.1	64	58.7
Arms	248	66.7	182	69.2	66	60.6
Hands	226	60.8	188	71.5	38	34.9
Trunk (back and chest)	250	67.2	174	66.2	76	69.7
Genitalia perineum	31	8.3	16	6.1	15	13.8
Legs	178	47.9	137	52.1	41	37.6
Feet	44	11.8	36	13.7	8	7.3
Inhalation injury						
No	197	53.0	99	37.6	98	89.9
Yes	175	47.0	164	62.4	11	10.1
Intent						
Unintentional	274	73.7	212	80.6	62	56.9
Intentional	94	25.3	49	18.6	45	41.3
No information	4	1.1	2	0.8	2	1.8
Comorbidity[c]						
No	268	72.0	185	70.3	83	76.2
Yes	104	28.0	78	29.7	26	23.9

[a] TBSA: Total Body Surface Area.
[b] Those categories are not mutually exclusive.
[c] Comorbidities include drug or alcohol abuse (n = 48), HIV infection (n = 43), respiratory limitation (n = 15), existing psychiatric disorder (n = 10), pregnancy (n = 4), cardiac limitation (n = 2), and medically induced immune-suppression (n = 2).

urban area, and 84% were referred from another level of care before admission to the burns centre. Across all cases, 68% were admitted within the first day (73% for flame burns).

When considering the referral criteria, all but three patients (99.2%) were admitted in adherence with at least one referral criterion. Out of the existing seven criteria (listed in Supplementary Fig. 1), the most common criteria identified were anatomical site (93.8%), injury severity (49.7%) and inhalation injury (43.0%; data not shown).

Approximately 20% of the patients stayed less than a week at the centre, while 34% stayed longer than a month. The median length of stay at the centre was 20 days, and the median length of stay per TBSA percentage burnt was 2.1 days. The overall mortality rate was 20%, and it was even higher or flame burns with over one in four patients succumbing to their injury. The LA50 (or TBSA lethal to 50% of the patients) in the population was 45% (data not shown).

All but three of the patients who did not survive their injury had a flame burn. Two of those patients that succumbed after a hot liquid burn had extensive burns (>50% TBSA); the other death was due to an assault and the cause of death was polytrauma (not the burn injuries). Focusing on flame burns, Table 3 presents the associations between individual patient, injury and admission-related characteristics with in-hospital mortality. Gender, but not age of the patient, was significantly associated with mortality: women had twice the odds of mortality as men (OR = 2.20; CI = 1.26–3.83). With regard to injury characteristics, patients with deep partial or full thickness burns had 5.30 (CI = 2.28–12.29) times the odds of mortality as those with superficial or mid-partial thickness burns. Those who sustained inhalational burns had odds of mortality of 4.29 (CI = 2.17–8.48) compared to those who did not. As for burn size, there was a 1.10 increase in odds (CI = 1.08–1.13) of dying for each 1% increase in the size (TBSA) of the burn. Finally, patients who came directly to Tygerberg Hospital without being referred from another level of care had a 3.21 higher risk compared to referred patients (CI = 1.61–6.41). All other admission-related variables were not associated with mortality.

The results of the multivariate analyses are presented in Table 4. After adjustment of all the significant variables for one another, only three characteristics remained significantly

Table 2 – Description of patients' admission and treatment characteristics for patients admitted in 2015 and 2016, all patients aggregated and by burn mechanism.

Admission and treatment characteristics	Total (n = 372)		Flame (n = 263)		All others (n = 109)	
	N	%	N	%	N	%
Residential area						
Urban	292	78.5	200	76.1	92	84.4
Rural	80	21.5	63	24.0	17	15.6
Referral status						
Not referred	58	15.6	40	15.2	18	16.5
Referred	314	84.4	223	84.8	91	83.5
From a clinic	85	27.1	48	21.5	37	40.7
From a hospital	229	72.9	175	78.5	54	59.3
Time to admission (in days)						
0–1	254	68.3	191	72.6	63	57.8
2–7	118	31.7	72	27.4	46	42.2
Adherence to the provincial referral criteria						
Yes	369	99.2	261	99.2	108	99.1
No	3	0.8	2	0.8	1	0.9
Admission to ICU						
No	121	32.5	51	19.4	70	64.2
Yes	245	65.9	210	79.9	35	32.1
No information	6	1.6	2	0.8	4	3.7
Length of stay (in days)						
≤7	71	19.1	48	18.3	23	21.1
8–15	80	21.5	54	20.5	26	23.9
16–30	94	25.3	60	22.8	34	31.2
31–60	96	25.8	77	29.3	19	17.4
61–90	24	6.5	19	7.2	5	4.6
>90	7	1.9	5	1.9	2	1.8
Mortality						
No	296	79.6	190	72.2	106	97.3
Yes	76	20.4	73	27.8	3	2.8

ICU: Intensive Care Unit.

Table 3 – Associations between patient and injury characteristics and in-hospital mortality expressed as odds ratios for patients with flame burns (n = 263).

	Mortality n	%	Crude OR	95% CI	P value
Patient characteristics					
Gender					
Male (n = 175)	39	22.3		Ref	
Female (n = 88)	34	38.6	2.2	1.3–3.8	0.006
Age (in years)					
12–20 (n = 39)	11	28.2		Ref	
21–40 (n = 146)	35	24.0	0.8	0.4–1.8	0.587
41–60 (n = 67)	22	32.8	1.2	0.5–2.8	0.620
61–90 (n = 11)	5	45.5	2.1	0.5–8.4	0.284
Injury characteristics					
Burn depth					
Superficial or mid partial (n = 73)	7	9.6		Ref	
Deep partial or full thickness (n = 164)	59	36.0	5.3	2.3–12.3	0.000
No information (n = 26)	7	26.9	3.5	1.1–11.2	0.036
Burn size					
By percentage increase TBSA (n = 263)	73	27.7	1.1	1.07–1.13	0.000
Inhalational injury					
No (n = 99)	12	12.1		Ref	
Yes (n = 164)	61	37.2	4.3	2.2–8.5	0.000
Comorbidity					
No (n = 185)	47	25.4		Ref	
Yes (n = 78)	26	33.3	1.5	0.8–2.6	0.191
Injury intent					
Unintentional (n = 212)	54	25.5		Ref	
Intentional (n = 49)	18	36.7	1.7	0.9–3.3	0.114
Admission-related characteristics					
Time to admission (in days)					
2–7 (n = 72)	17	23.6		Ref	
0–1 (n = 191)	56	29.3	1.3	0.7–2.5	0.358
Referral status					
Referred (n = 223)	53	23.8		Ref	
Not referred (n = 40)	20	50.0	3.2	1.6–6.4	0.001
Level of referring hospital					
Clinic (n = 48)	13	27.1		Ref	
Hospital (n = 175)	40	22.9	0.8	0.4–1.7	0.543

associated with in-hospital mortality: female gender (OR = 3.77), burn size (OR = 1.11 per 1% increase in TBSA), and not being referred from another hospital (OR = 2.86). On the other hand, inhalation and burn depth were not significantly associated with mortality in the multivariate model.

With regard to the ABSI score, the mean score for all patients admitted with fresh burns was 6 (7 for flame burns). All patients burned by a mechanism other than flame had an ABSI score of less than 9. Table 5 presents the percentage of observed mortality for each ABSI score grouping, together with the predicted value defined originally by Tobiasen and Hiebert [13]. The observed mortality frequencies were in line with those predicted by the ABSI score, although all 13 cases with a score of 12 or 13 died from their injuries in this setting. Finally, using an ABSI score cut-off of 8 as predicting over 50% of the deaths, we obtained a sensitivity of 84% a and specificity of 86% (estimating 64 of the 76 deaths cases). When including only flame burns, the sensitivity was of 85% and the specificity of 81%.

4. Discussion

During the study period, admission to this specialised burns centre for adults followed the provincial referral criteria. One in five patients died on site and almost all of them had sustained flame burns. After adjustment, three factors stood out as significantly associated with in-hospital mortality: having a large burn, being female, and being admitted without prior referral. That the ABSI score had both high sensitivity and

Table 4 – Multivariate associations between patient, injury and admission-related characteristics with in-hospital mortality expressed as adjusted odds ratios for flame burn patients (n = 263).

Characteristics	Odds ratios	95% CI	P value
Gender			
Male		Ref	
Female	3.77	1.68–8.50	0.001
Burn depth			
Superficial or mid partial		Ref	
Deep partial or full thickness	1.56	0.57–4.22	0.386
No information	1.78	0.41–7.71	0.436
Burn size			
By percentage increase TBSA	1.11	1.08–1.14	<0.001
Inhalational injury			
No		Ref	
Yes	1.20	0.47–3.06	0.709
Referral status			
Referred		Ref	
Not referred	2.84	1.09–7.42	0.032

high specificity indicates it could identify both patients who were likely to die at the unit (true positives) and those likely to survive (no false negatives).

Not surprisingly, the mortality rate observed is higher than that reported from individual burns centres from HICs [8,9] and more along the line of the 16.9% averaged from several previous African studies [32]. Within the South African context, the rate is higher than that reported from two burns units from Kwa-Zulu Natal [27,33], which may be a reflection of differences in caseloads, as these units do not manage serious burns that have a TBSA larger than 40%. At the Tygerberg centre, the mortality rate is lower than that reported about ten years ago [22]. As the cases managed in 2015 and 2016 seem as severe as those reported previously, there is good reason to believe that the reduction is linked to the recent upgrade of the facilities [19].

In this study, female gender was associated with mortality, but not age. The lack of association with age is surprising as age is included in several mortality prediction models [14,18] but, among the Tygerberg patients, there are no children younger than 12 and only a few older patients — a very high-risk group [34–36]. The fact that female adult patients are at higher risk of in-hospital mortality has been observed in some American studies [37–40] but not all [34,35]. The reasons for the association are unclear but elements of explanation can be found in both physiological factors that make women more vulnerable [37,38,41] and health care factors implying that women are treated [42] or discharged [43] differently.

Regarding in-hospital mortality in light of the injury characteristics, as could be expected [8,22,23,33], flame burns stood out, although it was unexpected that almost all deaths were flame-related. This relative homogeneity of the cases may explain why burn size was the only factor significantly associated with mortality after adjustments, echoing results of a study from Ghana [26].

While admissions followed the referral criteria, patients who were not referred were more likely to die at the centre than those who were referred and sent from lower levels of care. The health care organisation may be the main explanation for this finding since, at the hospital, burns patients who were not referred were first admitted to the trauma unit and thereafter to the centre once a bed was available. Their condition may have deteriorated while waiting. Due to the shortage of beds at the burns centre, it is likely that patients with burns of similar severity from referring hospitals would have died before their transfer [19]. Actually, high ABSI scores (12 and above) were more common among patients brought directly to the trauma care unit of the hospital than among referred patients (9% compared to 3%)

As the referral criteria are followed, and were the centre take a stand towards lowering the rate of mortality, using the ABSI score for case-specific decisions could be a suitable option. This could maximise the benefit of the care that the centre can provide, guiding patients with poor prognosis towards palliative care [24]. The performance of the ABSI score at Tygerberg compares to that observed in resource-rich settings [25] and in the Ghanaian context [26]. It does, however, differ from two other resource-scarce settings, one also from South Africa, Edendale Hospital [27] and one from Kenya, Kenyatta National Hospital [44] where the interpretation of the mortality risk associated with each score had to be adapted. It is possible that even other prediction scores could be instrumental to individual decision making but there are

Table 5 – Total ABSI burn score, level of threat to life and probability of mortality previously described in Ref. [13] as well as the total number of patients and mortality rates observed in 2015 and 2016 for all fresh burns (and for flame burns only) at Tygerberg Hospital burns centre.

Total burn score	Previously described in Ref. [13]		Observed	
	Level of threat to life	Probability of mortality in %	Total number of patients with fresh burns (with flame burns)	Mortality rate in %, for all fresh burns (for flame burns)
2–3	Very low	<1	44 (21)	0 (0)
4–5	Moderate	2	104 (55)	1.9 (1.8)
6–7	Moderately severe	10–20	119 (88)	8.4 (11.4)
8–9	Serious	30–50	59 (53)	5.8 (47.2)
10–11	Severe	60–80	33 (33)	72.7 (72.7)
12–13	Maximum	>90	13 (13)	100.0 (100.0)

indications that the staff of the centre uses ABSI at times (as seen on some of the patient files) and the performance of other scores has not been tested here.

The main methodological strengths of the study lie in the relatively large coverage (two years of observation and all patients with fresh burns admitted to the centre during the period), the broad range of data collected on site, and the limited number of missing cases and missing information. But it is of note that we missed information on the depth of the burn in 10% of the cases. We do not believe this affected the results: there does not seem to be any systematic bias and we get similar results (namely that deeper burns were associated with mortality in univariate analyses but not in the adjusted model) whether we included those cases or excluded them (imputation analyses; results not presented).

The time window of 60 days that we used to define “in-hospital mortality” is relatively long. In fact, nearly half of the patients (45%) died during the first week of stay while one in four succumbed to their injury after two weeks. In other words, those one in five who die within 60 days do so often in the days following admission or after some weeks. This, in turn raises the question of priority setting in the face of scarce resources [24]. It is beyond the scope of this study to investigate the length of stay, but were decisions to be made concerning how the resources are used, this aspect would definitely need consideration [45]. However, in this setting, prolonged stay at the hospital may reflect, not only poor health conditions but also transport, social and economic issues as well.

Similar to the few other studies carried out in Sub-Saharan Africa, the burns centre in focus in this study has a large catchment area and rather insufficient capacity in relation to the number of potential cases. This implies that many patients will enter the unit after a certain waiting time and that there will be difficult decisions to be made between palliative and curative care. We believe therefore that the results obtained could be applicable – or informative – for other centres of the same kind, provided that admission criteria follow similar norms.

If the centre is going to be able to reduce mortality with its current capacity, it will need to make difficult decisions at admission. In order to triage patients in the most efficient manner and use the resources more appropriately, admission to specialised centres will probably have to be based on more stringent criteria with regards to severity. This could include the use of several instrument measures such as combining the ABSI score with referral criteria, or with other prediction models [27] given that the ABSI has strong metric properties in a group of such severely injured patients.

5. Conclusion

In this specialised and clinically advanced burns centre, this study helps to understand the level of – and variations in – observed mortality. Almost all patients were admitted in adherence with the local referral criteria. This did not prevent one in five patients from succumbing to their injury while at the centre. The mortality was significantly associated with being female, increasing size of the burn, and not being referred. The ABSI score was a good representation of the mortality risk at admission to the burns centre and could be used to complement the existing referral criteria for triage decisions.

Author contribution

Study design and research questions were decided by CB, and LL. CB, WK, and LW took responsibility for the data collection. The plan for data analyses were jointly determined by CB, LW and LL. CB then performed the data analysis accordingly. The manuscript was drafted by CB and LL. All authors contributed to the interpretation of the results and approved the final manuscript.

Declaration of interest

None.

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Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:https://doi.org/10.1016/j.burns.2019.03.005.

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