Hypothermia in severe burns presenting at a regional burns centre

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Introduction

The NICE Clinical guideline on hypothermia [CG65] (2016) (1):

- Hypothermia = Core T of <36.0˚C(96.8˚F)
- Normothermia = Core T of 36.5—37.5˚C
- Core T is the temperature of the blood & internal organs.

The BMJ best practice states that a threshold of 36˚C should been adopted in **patients with trauma** because even milder degrees of hypothermia have devastating consequences for trauma patients (2).

DEFINITIONS	NICE (2016)
Mild hypothermia	35-35.9˚C
Moderate hypothermia	34-34.9˚C
severe hypothermia	<34˚C

Causes of hypothermia in burns (3):

- damage to heat loss barrier
- cooling of burn
- exposure during assessment & dressings

Pathophysiological consequences of untreated hypothermia can be detrimental.

Previous studies on hypothermia in burns:

- Lukusa et al found that in paediatric patients there is an increase in early sepsis & in adults patients an increase in mortality & length of hospital stay. They also found that TBSA had impact on hypothermia.(4)
- Ziegler et al also found that hypothermia on admission was directly linked to worse outcome regarding mortality in severe burns.(5)

Measurement of core T can be done as follows:

- Lower third of oesophagus
- Pulmonary artery temperature
- Low-reading tympanic thermistor-based thermometer

❖ Conventional mercury thermometers are not recommended for measuring core T.
❖ Bladder & rectal temperature lag behind core T.
❖ possible inaccuracies in core T estimation using peripheral sites e.g. sublingual / axilla, when the core T is outside the normothermic range.

Recommended re-warming strategies for treating hypothermia include:

- Passive external re-warming for mild cases e.g. blanket
- Active external re-warming for moderate to severe cases e.g. Bair-hugger
- Active internal re-warming for moderate to severe cases e.g. peritoneal lavage.

Aim

- To determine incidence of hypothermia amongst severe burns admitted to the Mersey regional burns centre.
- To evaluate practices around temperature recording and patient re-warming in acute burns.

Methodology

A retrospective study was carried out using patient records retrieved from the burns database at Whiston hospital. All severe burns requiring fluid resuscitation admitted between October 2018 and April 2021 were included.

Variables analyzed included: demographics, mechanism of burn, total body surface area (TBSA), time from injury to admission, Modified Baux score, poly-trauma, Glasgow Coma Scale, temperature on scene, temperature in emergency department, temperature on admission to burns or ITU, and use of rewarming.

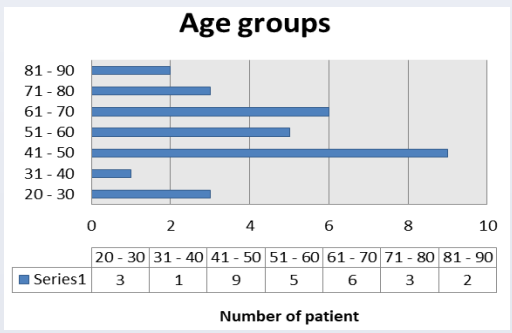
Results

32 adult patients recorded as TBSA ≥15% in burns database.

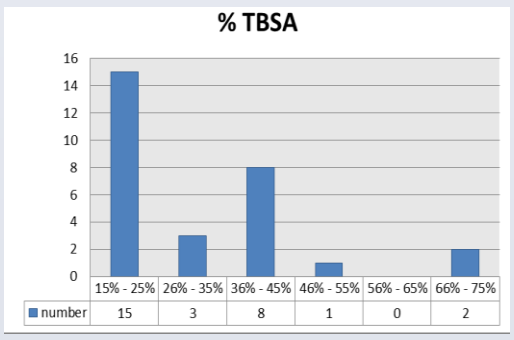
- 2 excluded - non-burns (SJS/TENS)
- 1 excluded – TBSA <15% after debridement

AGE RANGE: 23 – 87 years

SEX: M:F = 19:10



	20 - 30	31 - 40	41 - 50	51 - 60	61 - 70	71 - 80	81 - 90
Series1	3	1	9	5	6	3	2



	15% - 25%	26% - 35%	36% - 45%	46% - 55%	56% - 65%	66% - 75%
number	15	3	8	1	0	2

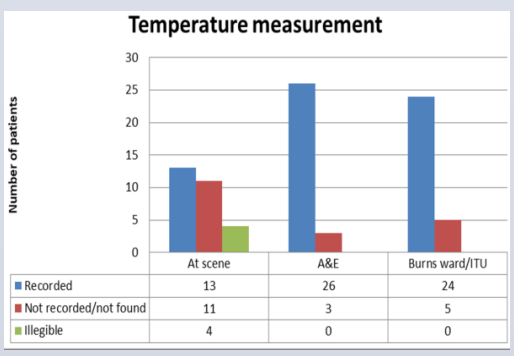
MECHANISM: 25 patients had flame burns , 3 scald & 1 each for electrical & chemical burns

POLY-TRAUMA: 5 out of 29

- 3 patients had GCS <15
- 1 patient intubated on scene

HOSPITAL PRESENTATION - time ranged from 40 mins – 24 hours

- Longest delays 17hr and 24 hrs
- Most delays attributed to patient factors e.g intoxication, mental health problems



	At scene	A&E	Burns ward/ITU
Recorded	13	26	24
Not recorded/not found	11	3	5
Illegible	4	0	0

TEMPERATURE DOCUMENTATION:

Temperature recording/documentation poor by first responders – no temperature recorded for about half the patients (see figure)

REWARMING DOCUMENTATION:

- Ambulance transfer: rewarming method only recorded for 1 out of 29

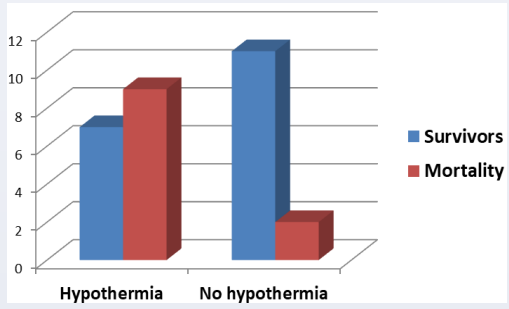
MORTALITY: 11 out of 29 patients died

➢ **Modified Baux score**

- Mortality group mean = **113** (SD 18.5)
- Survivors group mean = **81.8** (SD 17.2

HYPOTHERMIA: 16 out of 29 (55%) had hypothermia at initial assessment.

➢ First temperature recorded (ambulance or ED)
➢ Survivors group generally had higher temperatures than non-survivors group
➢ **Hypothermia & Baux score:** Patients with hypothermia had a higher mean Modified Baux score of 108 (SD 18.1) Vs 76 (SD 16.9) in those without hypothermia
➢ **Hypothermia & TBSA:** Patients with hypothermia had a higher mean TBSA of 35.9% (SD 13.4) Vs those without hypothermia 23.9% (SD 7.9)



Hypothermia & Mortality: Patient with hypothermia had 56% mortality versus to those that were normothermic (15%).

Discussion

Our results show a higher incidence of mortality in patients who had hypothermia. Patients with hypothermia also have significantly higher mean Modified Baux scores and TBSA than those without hypothermia. There seems to be an association between high TBSAs and high Baux scores and hypothermia.

The study, however, had insufficient power to perform statistical analyses to determine significance of results. This study could suggest that hypothermia on admission is a prognostic indicator for mortality in severe burns. This retrospective analysis could not determine how temperature was recorded and which devices were used.

Conclusions

Our study demonstrates a link between hypothermia and mortality but not whether this link is causative. Our study also demonstrates a link between TBSA and hypothermia. Previous studies have suggested a link between hypothermia and mortality but this could be because patients with higher TBSA also have lower temperatures on presentation. A well designed study with large sample size is therefore required to determine whether hypothermia is simply a surrogate marker of high TBSA/Baux score or whether it is an independent variable that is associated with mortality. Previous studies have been insufficiently powered or designed to prove this.

This study also demonstrates that more can be done to reduce hypothermia throughout the pathway for our burn patients, especially during transfer, and we are looking to see what additional measures can be implemented to improve this.

Recommendations

❖ Staff education (including ambulance & ED staff)
  - Importance of patient re-warming
  - Improve documentation of patient temperature and warming strategy

❖ Infrastructure & equipment
  - Overhead heaters in ED assessment room
  - Use of fluid warming coils
  - Uniform and accurate method of measuring core T for burns patients

❖ Consider taking patients with resus burns early to theatre for debridement and re-warming.

REFERENCES

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