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## **Burns and Scalds Assessment Template: Standardising clinical assessment of childhood burns in the Emergency Department**

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Key words: “burns”, “paediatrics”, “paediatric emergency med”, “paediatric injury”, “paediatrics, non accidental injury”

## **Abstract**

**Objective:** The Burns and Scalds Assessment Template (BaSAT) is an evidence-based proforma co-produced by researchers and Emergency Department (ED) staff with the aim of a) standardising the assessment of children attending ED with a burn, b) improving documentation and c) screening for child maltreatment.

This study aimed to test whether the BaSAT improved documentation of clinical, contributory and causal factors of children's burns.

**Method:** A retrospective before and after study compared the extent to which information was recorded for 37 data fields after the BaSAT was introduced in one Paediatric ED. Pre-BaSAT, a convenience sample of 50 patient records of children who had a burn was obtained from the hospital electronic database of 2007. The post-BaSAT sample, included 50 randomly selected case notes from 2016/17 that were part of another research project. Fisher's exact test and Mann-Whitney U-tests were conducted to test for statistical significance.

**Results:** Pre-BaSAT, documentation of key data fields was poor. Post-BaSAT this varied less between patients and median completeness significantly ( $p < 0.001$ ) increased from 44% (IQR 4%-94%) to 96% (IQR 94%-100%). Information on 'screening for maltreatment, referrals to social care and outcome' was poorly recorded pre-BaSAT (median of 4% completed fields), and showed the greatest overall improvement (to 95%,  $p < 0.001$ ). Documentation of domestic violence at home and child's ethnicity improved significantly ( $p < 0.001$ ) post-BaSAT, however these were still not recorded in 36% and 56% of cases respectively.

**Conclusion:** Introduction of the BaSAT significantly improved and standardised the key clinical data routinely recorded for children attending ED with a burn.

### **What this paper adds:**

1. What is already known on this subject
  - An estimated 40,000 children attend Emergency Departments in England and Wales with a burn or scald every year.
  - The Burns and Scalds Assessment Template (BaSAT), a proforma used in 13 Paediatric Emergency Departments and Minor Injury Units in the UK, has informed numerous epidemiological research studies to date.
  - Whether the BaSAT improves the quality and standardisation of clinical notes has not been quantified.
2. What this study adds
  - In this uncontrolled pre and post study at a pediatric ED, we saw a significant improvement in clinical documentation for children attending emergency care with a burn.
  - Greatest improvement was seen in 'screening for maltreatment, referrals to social care and outcome' where the median percentage of documented fields per child improved from 4% pre-BaSAT to 95% post-BaSAT.
  - While the results of this study would support the use of the BaSAT in paediatric ED's, given this was single centre study with a nine year time period between data points, further research is recommended to validate these findings.

## **Introduction and background**

A standardised proforma, the Burns and Scalds Assessment Template (BaSAT) (Appendix 1), was developed by a burns research team and emergency physicians, for children who present with a burn to the Emergency Department (ED). The template was initially designed for a research project collating epidemiological data on childhood burns<sup>1,2</sup>. It has undergone multiple revisions, responding to the advancing literature in burns injury as well as the clinical needs of the ED physicians. The BaSAT was developed with input from authors of this paper to the exclusion of the lead investigators (KH/CVB/SM).

The BaSAT is evidence based and developed as a multi-functional template. It acts as a clinical record, replacing the emergency department flimsy and provides a structured approach to the history and examination of the patient and focuses on salient points relating to safeguarding in childhood burns. To date, the BaSAT has been used in over 4,000 children who have attended emergency care. These epidemiological<sup>1 2</sup> data have contributed to primary burns prevention strategies<sup>3 4</sup>.

The BaSAT is currently active in 13 ED and minor injury units in England and Wales. As a research tool the validity of the template is acknowledged<sup>1 2 4-6</sup>. However, the clinical utility of the BaSAT has not previously been quantified.

This study aimed to evaluate the BaSAT as a clinical proforma, assessing its impact on the documentation.

## **Methods**

We performed a retrospective before and after study at the University Hospital of Wales PED. This tertiary PED manages over 32,000 attendances per year. A convenience sample, over a 12-month time period, of 50 patient records of children who had a burn was obtained from the hospital electronic database of 2007, prior to the introduction of the BaSAT in 2008. BaSAT version 6 was incorporated into routine clinical records from 2014. The pre-BaSAT data was extracted by a single researcher (KH, medical student). KH was independent to the research team and extracted data on a bespoke form, recording only what was documented in the notes. KH was unaware of the hypothesis of this project.

The post-BaSAT sample, included 50 randomly selected case notes from 2016/17 (KH was attached to the ED at this time). The post BaSAT data were obtained by DN from cases on REDCAP as part of another research project.

The BaSAT comprises 52 data fields. Patient's hospital number, name, postcode and date of birth were excluded from analyses as these fields are routinely recorded in the notes using hospital patient identification labels. Fields dependent on the completion of other fields were also excluded. The remaining 37 fields were divided into 4 sections; 'patient and clinician details', 'history of the injury', 'characteristic of the injury' and 'screening for maltreatment, referrals to social care and outcome' (e.g. discharge and follow-up).

There was no patient and public involvement in this research project.

### **Analysis**

Fisher's exact tests were used to compare proportions of completed fields in the two different years using Stata v.15<sup>7</sup>. To adjust for multiple testing, we used a Bonferroni-corrected p value of 0.001. Median percentage change for the four sub-sections and overall were analysed with Mann-Whitney U-tests.

### **Ethics**

Ethical approval (13/WA/0003) and approval from Confidentiality Advisory Group (CAG) (CAG 1-06(PR7)/2013) were received to enable data collection from case notes for research with waived consent. This project was registered with the hospital audit team.

### **Results**

Pre-BaSAT, a median of 44% (IQR 4%-94%) of the 37 data fields were recorded per child. 'Patient and clinician details' were the best recorded fields with a median of 94% of fields recorded, whereas only 4% of information in the 'screening for maltreatment, referrals to social care and outcome' category was recorded (Fig.1). Pattern of injury, whether the family had an active or previous social worker, ethnicity and presence of domestic violence were not recorded in any of the 50 cases pre-BaSAT (Fig.2).

The recording of type of burn injury was similar for the two time points (contact burn 40% vs 46%; scald 54% vs 46%; other 6% vs 8% for 2007 and 2016 respectively). The child's age, gender, date and time of assessment, type of injury, explanation and burn agent were recorded in 100% of cases in both (Fig.2).

Post-BaSAT, the median percentage of the 37 data items recorded for each child increased significantly ( $p < 0.001$ ) to 96% (IQR 94%-100%) (Table 1).

**Table 1.** Comparison of pre and post completion of data fields following implementation of the BaSAT. \* N is not 50. The number of participants of this field is dependent on other factors or answers to previous questions. Where N does not equal 50, the value is denoted in the space.

Category	Field Name	Pre-BaSAT (2007)		Post-BaSAT (2016)		p-value
		Checked (N=50)	% Checked	Checked (N=50)	% Checked	
Patient and Clinician Details	Age at Time of Injury	50	100	50	100	1.00
	Gender	50	100	50	100	1.00
	Ethnicity	0	0	22	44	<0.001
	Date Assessment Undertaken	50	100	50	100	1.00
	Time assessment undertaken	50	100	49	98	1.00
	Date injury occurred	47	94	50	100	0.24
	Time injury occurred	28	56	47	94	<0.001
	Person completing this form	43	86	47	94	0.32
	Who is accompanying the child	39	78	47	94	0.04
History of Injury	Type of Injury	50	100	50	100	1.00
	Location	27	54	49	98	<0.001
	Was anyone in the room / vicinity at the time?	21	42	49	98	<0.001
	What is the explanation for the injury?	50	100	50	100	1.00
	What was the child doing just before the incident?	22	44	49	98	<0.001
	Agent	50	100	50	100	1.00
	Location of hot item	35	70	47	94	0.003
	Mechanism	48	96	50	100	0.50
	Was first aid given by the parent / carer?	33	66	50	100	<0.001
	Was the burn covered?	2	4	43	86	<0.001
	Was analgesia administered by the parent / carer prior to arrival at ED?	7	14	48	96	<0.001
Characteristics of Injury	Was a body map completed?	42	84	50	100	0.006
	Was the pattern of injury recorded?	0	0	47	94	<0.001
	Was the depth of injury recorded?	46	92	50	100	0.12
	Total Body Surface Area (%)	8	16	50	100	<0.001
	Were there any other injuries on examination?	12	24	49	98	<0.001
Screening Referrals and Outcome	Was there appropriate adult supervision?	3	6	48	96	<0.001
	Late presentation?	3	6	48	96	<0.001

	Was the explanation consistent with the stage of development?	2	4	44	88	<0.001
	Did it fit with the pattern seen?	4	8	37	74	<0.001
	Is there any developmental impairment?	2	4	46	92	<0.001
	Was there any previous ED Attendance?	2	4	44	88	<0.001
	Does the child / family have a social worker now?	0	0	48	96	<0.001
	Did the child / family have a SW or any SS Involvement in the past?	0	0	47	94	<0.001
	Is there any domestic violence in the home?	0	0	32	64	<0.001
	Was a child protection referral made?	2	4	48	96	<0.001
	Were any other referrals made?	20	40	48	96	<0.001
	Outcome	48	96	48	96	1.00

‘Screening for maltreatment, referrals to social care and outcome’ saw the greatest improvement between years (4% pre, 95% post;  $p<0.001$ ), followed by ‘characteristics of injury’ (24% pre, 100% post;  $p=0.008$ ), and ‘history of injury’ (66% pre, 100% post;  $p=0.02$ ). There was no improvement in ‘patient and clinician details’ (94% pre, 98% post;  $p=0.52$ ) as it was already high to start with. (Fig.1). The overall variance within the four categories post-BaSAT was reduced as shown by the narrowing of the interquartile range (Fig.1).

Pattern of injury and total body surface-area (TBSA) were recorded in substantially more cases in 2016 than 2007, increasing from 0% to 94% ( $p<0.001$ ) and 16% to 100% ( $p<0.001$ ) respectively (Fig.2). Whether the parents/carers conducted any first aid increased from 66% pre to 100% post ( $p<0.001$ ). Ethnicity and domestic violence remained poorly documented post-BaSAT, being documented in only 44% and 64% respectively of cases (Fig.2).

## Discussion

Post implementation of the BaSAT, a statistically significant improvement in clinical documentation for children who attended PED with a burn was noted. This was most notable in areas concerned with child maltreatment.



These results are valuable but potentially limited by the small sample size at a single institution. The datasets were nine years apart and chosen due to the ongoing development of the BaSAT. The unit was involved in co-developing the BaSAT and participated in other branches of burns research. Furthermore, within the time period, a paediatric emergency consultant was appointed. These factors may have a benefit on education and training with the potential to influence any improvement in documentation. There is the potential for measurement bias given data extraction was undertaken by different personnel at different times. Of note, there were no changes to IT systems and the records remained hand written at both time points. A strength of the study is that we only assessed what was documented in the ED notes at both time points, allowing for a direct comparison to be made. We did not assess other documentation i.e. in-patient notes as the BaSAT was designed for an ED setting.

An estimated 10% of burns arise from child maltreatment<sup>8</sup> yet these are under recognised in children presenting to the ED. In the post-BaSAT cohort, significant improvement in recording 'screening for maltreatment, referrals to social care and outcome' and increases the potential for early recognition and referral of these cases for safeguarding assessment. It is important to acknowledge the areas which remained poorly completed in particular domestic violence. Our research team hypothesise that clinicians may feel uncomfortable asking these questions in acute cases involving an unwell child or where both parents are present. Further studies are required to explore how to improve screening for domestic violence in the ED setting.

Prompt burns first aid has the potential to reduce the size and depth of the wound. The results demonstrated improved documentation of home first aid after implementation of the BaSAT. The BaSAT may prompt the clinician to enquire if adequate first aid was performed and if not to cool the burn in ED within the three hour recommended window<sup>11</sup>.

We believe the BaSAT prompts better documentation as the depth of questions asked allows the clinician to gain a greater appreciation of the intricacies of the case, which may be lost if one simply added a few open-ended questions to the standard documentation. We would recommend studies using BaSAT in other units to ascertain if similar results are identified in departments that have not been involved in the production of this template as we believe the BaSAT has the potential to prompt thorough clinical assessment, ensure that safeguarding risks are considered, monitor local trends in the causes of childhood burns and inform injury prevention.

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**Clinical trial registration:** Not applicable.

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**Competing interest:** None declared.

**Appendix 1.** The BaSAT proforma.

**Figure 1.** Median percentage completion of information within patient notes pre and post introduction of the BaSAT by category. Error bars denote interquartile range.

**Figure 2.** Percentage of records in which each of the 37 data fields were recorded pre and post introduction of the BaSAT. Significant ( $p < 0.01$ ) improvement of completion of data fields denoted by \*

**Table 1.** Summary of all data fields. \* N is not 50. The number of participants of this field is dependent on other factors or answers to previous questions. Where N does not equal 50, the value is denoted in the space.