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**Exploring the acceptability of a clinical decision rule to identify paediatric burns due to child abuse or neglect**

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**Key words:** Paediatric non accidental injury, burns, clinical decision rule.

## Exploring the acceptability of a clinical decision rule to identify paediatric burns due to child abuse or neglect

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### Abstract

**Objective:** An evidence based Clinical Decision Rule (CDR) was developed from a systematic review and epidemiological study to identify burns due to child maltreatment (abuse or neglect). Prior to an implementation evaluation, we aim to explore clinicians' views of the CDR, the likelihood that it would influence their management, and factors regarding its acceptability.

**Methods:** A semi-structured questionnaire exploring demographics, views of the CDR and data collection proforma, ability to recognize maltreatment, and likelihood of following CDR recommended child protection (CP) action, was administered to 55 doctors and nurses in 8 Emergency Departments and 2 burns units. Recognition of maltreatment was assessed via four fictitious case vignettes. Analysis: Fisher's exact test and variability measured by coefficient of unalikeability.

**Results:** The majority of participants found the CDR and data collection proforma useful (45/55 = 81.8%). Only 5 clinicians said that they would not take the action recommended by the CDR (5/54, 9.3%). Lower grade doctors were more likely to follow the CDR recommendations (P=0.04) than any other grade, while senior doctors would consider it within their decision making. Factors influencing uptake include: brief training, background to CDR development and details of appropriate actions.

**Conclusions:** It is apparent that clinicians are willing to use a CDR to assist in identifying burns due to child maltreatment. However, it is clear that an implementation evaluation must encompass the influential variables identified to maximize uptake.

## **Introduction**

It is estimated that over 50,000 children attend the Emergency Department (ED) with burns annually in the United Kingdom.(1) Child abuse is an important cause of burns with approximately 6-20% of physically abused children sustaining burns.(2) Amongst children presenting with a burn, intentional burns constitute 3.8-26% of childhood burns in the USA (3-6) and 2-9.3% in the UK.(7-9) Furthermore, burns as a consequence of neglect outnumber intentional burns by 9:1, yet these can be the most challenging cases to identify.(7) Thus, child maltreatment should be a consideration for any child presenting with a burn.

Even children who sustain an unintentional burn appear to be more likely to suffer later neglect or abuse. A recent case control study of children aged less than 3 years admitted with a burn showed that almost one third of children with burns had been referred to social services because of child protection concerns by their sixth birthday.(10) Recent systematic reviews have shown a lack of effective, validated, generic emergency department (ED) tools for identifying childhood maltreatment.(11, 12) An injury specific tool may be more effective, as in other disciplines e.g. for identifying head injury.(13)

A rigorous systematic review(14) , followed by a prospective study of children attending ED or Burns units with burns or scalds, enabled the development of a Clinical Decision Rule (CDR) to identify burns due to maltreatment at our centre.(15) The proforma underpinning this CDR is currently in use at a number of EDs as part of its validation, without indicating the CDR score to the clinician who is completing it. The manuscript detailing the derivation and validation of this burns CDR is currently being prepared for submission. Clinical Decision Rules (CDRs) have been defined as tools that use history, physical examination or diagnostic tests to aid in clinical decision making.(16-18) Developing a CDR requires derivation, validation, and implementation including impact analysis.(16, 17) CDRs are most often used when the rule has reasonable evidence to improve clinical care or decision making, when there is convincing evidence that emergency physicians may be inaccurate in diagnosis(19) or when the rule minimises unwanted investigations.(20) There has been a recent increase in the number of CDRs being produced, but little is known about clinicians' use of such tools.(21)

We aim to explore the facilitators and barriers to using and following the recommended action of this newly developed CDR which assists in identifying burns due to child maltreatment; the goal is to inform the implementation evaluation of this CDR, and maximise its' uptake.

## **Methods**

A literature review and expert panel relating to potential barriers or facilitators of CDR use was conducted, from which a semi-structured questionnaire was developed. A small pilot (appendix 1) was conducted resulting in the final version (appendix 2). The Burns and Scalds Assessment Template (BASAT) is a comprehensive proforma that records all aspects of a child presenting with a burn to either an emergency department or a burns unit. The items within it were identified from previous systematic reviews of the literature relating to identifying features of burns or scalds due to maltreatment. (14) A derivation study to define distinguishing features of maltreatment was conducted during 2008 – 2010. (15) Following ongoing feedback from users, the final BASAT (version 4) was used in a prospective validation study of a potential CDR between 2013 – 2014 (article under review), for which ethical approval was granted; MREC-13/WA/0003.

The lead researcher (EJ) conducted face to face interviews using a semi-structured questionnaire, between 15th May - 24th July 2014, with staff in units involved in either the derivation or the validation of the BASAT as a potential CDR (figure 1). The participants had only used the BASAT as a data collection proforma and had not used the CDR that produces a score based on the BASAT information. Section 1 of the questionnaire detailed clinicians' demographics. Section 2 included exploration of participants' views of the BASAT as a proforma and the potential utility of the proposed CDR (appendix 2). The interviewer wrote down all responses at the time. Then the interviewer and SM conducted a thematic analysis of each individual's response.

Four vignettes were shown to the participant using completed BASAT proformas (without the CDR result) (appendix 3-10). The participant rated the cases as high, medium or low risk of maltreatment (appendix 11). This classification of levels of concern is based on the NICE Child Maltreatment Guidelines, whereby 'high' equates to 'suspect maltreatment' and 'medium' relates to 'consider maltreatment'(22). The four vignettes were created for participants to contextualise later questions regarding acting on CDR recommendations. After being told how the CDR scored the cases, participants were asked whether they would be prepared to take action recommended by the CDR in the future. The options offered were Yes or No. However during interviewing many participants answered "Yes, if..." and therefore for analysis the responses were grouped into yes, no and 'yes with a proviso'. Paediatric burns training was evaluated by asking participants what training they had undertaken categorised as: "undergraduate", "in service <half day" and "in service up to 2 days". For the purpose of analysis this was dichotomised into none (including undergraduate alone) or burns training (greater than or equal to half a day in service training).

We purposively sampled participants, specifically targeting a wide range of staff to ensure a balanced representation of adult and paediatric, senior and junior staff amongst both doctors and nurses. This was achieved by conducting the interviews on all days of the week, and at all times, and continuing to return to the departments until such time as all staff had been sampled sufficiently to achieve data saturation. Interviews were carried out in 8 ED units, 2 Minor Injury units and 2 regional Burns services across South Wales and Bristol (Figure 1). These ED units consisted of 3 paediatric departments, 3 Paediatric areas within a mixed adult/ child department, 2 mixed departments with no separate paediatric areas and 2 paediatric burns units.

After being told the CDR score for the four cases, participants were asked if overall, being told the score would have changed their management. The results and analysis of this question are in appendix 12.

## **ANALYSIS**

All analyses were conducted in STATA v. 13 (StataCorp LP, USA). We examined the influence of level of seniority of the staff interviewed (professional grade), Child Protection (CP) training and paediatric burns training on two main outcomes: variability of scoring of the vignettes and willingness to take the action recommended by the CDR (not at all/yes without proviso/yes with proviso). We first looked at whether the proportion of participants scoring the cases consistently with the CDR vs. the proportion identifying them as one of the other two risk categories, differed depending on grade, CP training and paediatric burns training using Fisher's exact tests. We then used the coefficient of unalikeability to measure variability in responders scoring. Unalikeability is defined as how often, not how much, observations differ from one another and is measured on a scale from 0 to 1. The higher the value, the more unlike the data are (23). The effect of grade, CP training and paediatric burns training on the willingness to take action recommended by the CDR was also analysed using Fisher's exact test. Significance level was set to  $P < 0.05$ .

A thematic analysis of the qualitative component was conducted by an examination of all themes raised during the interviews. These were coded by two members of the research team and analysed relative to the demographics of the participants. This was a service development, whereby the only BASAT CDRs used in this study related to four fictional cases, thus ethical approval was not necessary.

## **Results**

Demographics of participants are shown in Table 1 and Figure 1. Of the 62 health professionals approached, 55 participated, representing 20 higher grade doctors (i.e. consultants and registrars), 14 higher grade nurses (i.e. Emergency nurse practitioners and senior staff nurses), 12 lower grade doctors (i.e. foundation doctors, primary care trainees and speciality trainees ) and 9 lower grade nurses (staff nurses and health care assistants)

Characteristics		Participants (% of doctors) n=55		GMC registration statistics for the UK (accessed 4 <sup>th</sup> September 2014) (24)
<b>Gender</b>				
Female	Doctors	19 (59.4%)	44.3%	
	Nurses	20		
Male	Doctors	13 (40.6%)	55.7%	
	Nurses	3		
<b>Ethnic origin</b>				
Asian or Asian British	Indian	Doctors	4 (12.5%)	11.8%
		Nurses	0	
Black or Black British	African	Doctors	2(6.25%)	2.6%
		Nurses	0	
White	Other white background	Doctors	4 (12.5%)	10.3%
		Nurses	0	
	British	Doctors	22 (68.8%)	39.7%
		Nurses	23	
Other		Doctors	0 (0.0%)	35.9%
		Nurses	0	
<b>Characteristics</b>		<b>Participants</b>		
<b>CP Training (n=54)</b>				
No or little CP training		10 (18.2%)		
CP training level 1 or above		44 (80.0%)		
<b>Paediatric Burns training (n=55)</b>				
No paediatric burns training		28 (50.9%)		
Some Paediatric burns training		27 (49.1%)		

Table 1. Demographics of participants compared to all doctors registered in the UK as members of the GMC (General Medical Council).

## SCORING OF CASE VIGNETTES

Professional grade was associated with identification of case 1 as high risk, whereby higher grade doctors were more likely to identify case 1 as high risk (consistent with CDR score) compared to all other grades ( $P=0.017$ ) (table 2). Higher grade doctors (see figure 1) showed the least variable responses when identifying the high risk case (Co-U=0.50), followed by lower grade doctors (Co-U = 0.57), and lower grade nurses (Co-U= 0.57). Higher grade nurses were the most variable (Co-U= 0.66) Professional grade did not influence the identification of the remaining cases as medium or low risk cases. Participants of all grades were consistent with the CDR at identifying the low risk case (likely unintentional) with only 11/55 participants identifying this as 'medium' or 'high risk' of maltreatment. Lower grade doctors were the most variable at identifying the low risk case (Co-U= 0.50), followed by lower grade nurses (Co-U= 0.44), then higher grade nurses (Co-U=0.24) and higher grade doctors (Co-U= 0.18). There was no evidence that paediatric burns training affected clinicians' ability to identify maltreatment risk, and prior CP training was only associated with identifying the low risk case 4 ( $P=0.041$ ).



	Case 1 (High risk)				Case 2 (Medium risk)				Case 3 (Medium risk)				Case 4 (Low risk)			
	High risk*	Medium risk	Low risk	Co-U	High Risk	Medium risk*	Low risk	Co-U	High risk	Medium risk*	Low risk	Co-U	High risk	Medium risk	Low risk*	Co-U
Higher grade doctor (n=20)	9 (45%)	11	0	0.50	4	13 (65%)	3	0.52	8	8	4	0.64	0	2	18 (90%)	0.18
Higher grade nurse (n=14)	5 (36%)	5	4	0.66	0	12 (86%)	2	0.24	5	7	2	0.60	0	2	12 (86%)	0.24
Lower grade doctor (n=12)	2 (17%)	7	3	0.57	0	10 (83%)	2	0.27	8	4	0	0.44	2	2	8 (67%)	0.50
Lower grade nurse (n=9)	1 (11%)	3	5	0.57	2	4 (44%)	3	0.64	2	6	1	0.49	0	3	6 (67%)	0.44
	P= 0.017				P=0.190				P=0.391				P=0.211			
No/little CP training (n=10)	1 (10%)	6	1	0.54	5 (50%)	1	4	0.58	6	3	1	0.54	7 (70%)	1	2	0.46
CP training level 1 or above (n=44)	16 (36%)	20	8	0.63	33 (75%)	5	6	0.41	19	19	6	0.61	37 (84%)	7	0	0.27
	P=0.276				P=0.162				P=0.774				P=0.041			
No paediatric burns training (n=28)	9 (32%)	13	6	0.64	21 (75%)	2	5	0.40	12	13	3	0.56	23 (82%)	3	2	0.31
Some paediatric burns training (n=27)	8 (30%)	13	6	0.63	18 (67%)	4	5	0.50	13	10	4	0.61	21 (78%)	6	0	0.35
	P=1.000				P=0.697				P=0.752				P=0.257			

Table 2. Association between professional grade, Child Protection (CP) training(25), paediatric burns training and the ability to identify burns in children as high, medium or low risk with regard to maltreatment. 54 respondents to CP training. Variability in responses is measured as the “coefficient of unalikeability” (Co-U where higher values indicate higher variability in responses. P-values are from Fischer’s exact tests and evaluates whether the probability of classifying vignettes correctly is associated with grade, CP training and paediatric burns training. \* Denotes the score that is consistent with the CDR score.

## WOULD YOU TAKE THE ACTION RECOMMENDED BY THE CDR?

Action recommended by the CDR (appendix 11) was not followed by 5 clinicians (5/54, 9.3%) (Table 3). One was a burns unit staff nurse who said that ‘it was not part of her job’. Two senior staff nurses in a minor injuries unit refer all burns to the trauma hospital, and thus would leave it to this hospital to make any CP referrals. Of two higher grade doctors who would not take the recommended action, one said they would do so only if they agreed with the tool, and the other explained that they would assess each case on its own merits. The remaining participants either said yes (n=22) or yes with a proviso (n=27), details of which are given in figure 2. Professional grade showed a weak association with the likelihood of having a proviso to following the recommended action (Fisher’s exact test: P =0.04). Lower grade doctors were more likely than any other grade to follow the tool’s recommendation without a proviso, whereas higher grade doctors were more likely to have a proviso. Staff having undergone CP training were more likely to have a proviso to following the recommended action (Fisher’s exact test: P=0.01). Paediatric burns training had no effect on following the recommended action (Fisher’s exact test: P=0.11).

	Yes	Yes with proviso	No	Non-responders	P-value
<b>Higher grade doctors (n=20)</b>	3(15.0%)	14(70%)	2(10.0%)	1(5.0%)	P=0.04
<b>Higher grade nurse (n=14)</b>	6(42.9%)	6(42.9%)	2(14.3%)	0(0.0%)	
<b>Lower grade doctors (n=12)</b>	9(75.0%)	3(25.0%)	0 (0.0%)	0(0.0%)	
<b>Lower grade nurse (n=9)</b>	4(44.4%)	4(44.4%)	1(11.1%)	0(0.0%)	
<b>No or little CP training (n=10)</b>	8 (80.0%)	1 (10.0%)	1 (10.0%)	0(0.0%)	P=0.01
<b>CP training level 1 or above (n=44)</b>	14 (31.8%)	25 (56.8%)	5 (11.4%)	0(0.0%)	
<b>No paediatric burns training (n=28)</b>	15 (53.6%)	10 (35.7%)	3 (10.7%)	0(0.0%)	P=0.11
<b>Some paediatric burns training (n=27)</b>	7 (25.9%)	17 (63.0%)	3 (11.1%)	0(0.0%)	

Table 3. Association between professional grade, Child Protection (CP) training, paediatric burns training and taking action recommended by the CDR with or without a proviso.

## QUALITATIVE EVALUATION OF THE CDR AND BASAT PROFORMA

On exploring participants’ views of the tool, and the rationale behind their responses, some specific themes emerged. The majority of participants found the CDR and BASAT proforma useful (45/55 = 81.8%). A main theme was that the BASAT proforma helped to standardise documentation, with body maps being useful to illustrate location and distribution of burns, and it could be useful for audit or research. The BASAT proforma items were described as a useful “memory aid” for CP related questions. Junior staff in particular highlighted that it prompted them to ask about children’s motor skills, and supervision. In two of the units completion of the BASAT proforma (without the CDR score) was mandatory for any child presenting with a burn, however, several junior or temporary staff were unaware of it.

Training with the CDR was requested (63.6%, 35/55), preferably brief, perhaps as part of the department induction, incorporating how the CDR was developed, the evidence base and what to do with the CDR's rating (figure 2). Interestingly two lower grade doctors asked for the training to include what to do if their senior does not agree with the CDR's rating. The main negatives were the increase in paperwork (5.4%, 3/55), time taken to complete the BASAT proforma (7.3%, 4/55) and difficulty of use (1.8%, 1/55).

On exploring whether participants always asked all the BASAT proforma questions, 64.8% (35/54) said that they complete the whole BASAT. The one item that participants chose to omit occasionally related to 'domestic abuse'. The main reasons being: both parents were present, it was felt to be an inappropriate time as the child/parent was distressed by the burn, or they would ask about a social worker instead. Interestingly, two nurses explained that they use the BASAT proforma as a justification to ask about domestic abuse.

## **Discussion**

This evaluation of the acceptability of a CDR to identify burns due to maltreatment has highlighted that while clinicians may be willing to use a clinical decision rule, there is considerable variation among them as to the extent to which they would act upon the recommendations. The junior staff are the most likely to use the CDR, and be influenced by the result. This is reassuring, as it is likely that the junior staff feel more secure taking a recommended action in an area in which they lack confidence. There are clearly identified factors which will influence the uptake of this CDR, which need to be integrated into the 'roll out' of this CDR in practice.

While there is limited evidence for the impact of CDRs on practice in paediatrics, the evidence for clinical guidelines shows an improvement of health care after their implementation.(26) None the less, there is still reluctance among clinicians to utilise such guidance.(26, 27) Reluctance to use the tools will undermine their value, yet few groups developing CDRs have explored their acceptability prior to utilising them in practice.

In 2009 the government of the Netherlands introduced a legal mandate for all children attending ED to be screened for possible abuse, which may well have contributed to the increasing detection of abuse shown in their ED screening tools study.(28) However, in the UK, few screening tools have been found to improve the detection of child abuse of any type(12) and impact evaluation of these tools or interventions is lacking.(29) In 2002 Bengner et al conducted a two stage audit of a reminder flowchart with the aim to increase the number of referrals for further assessment and thus increasing the detection of abuse.(30) Bengner et al did report an increase in referrals though whether due to an increase in false positives or additional true positives is unknown as confirmation or exclusion of abuse was not reported. As yet there is no validated tool relating to burns specifically, despite clear evidence that maltreatment accounts for up to 26% of cases, and that children who sustain a burn prior to their third birthday are at increased risk of later maltreatment.(10)

Previous literature has identified barriers to the use of clinical guidelines(31, 32) or Prediction Rules(21) such as scepticism, format, wording of the paperwork and awareness of the rule or guideline. These proposed barriers did not arise in this study of the burns CDR. However this is the 4th version of the BASAT proforma following extensive feedback from earlier phases of the development. Despite completion of the BASAT proforma (without the CDR scoring) being required in two units, a number of the junior and temporary staff were unaware of completion being standard of care. It is clear that to maximise uptake of this CDR in practice it is important to ensure that all staff are fully aware of the CDR, as identified by Bressan et al in the implementation of a rule for children with minor head injury in the ED.(33)

Brehaut et al developed the Ottawa Acceptability of Decision Rule Instrument (OADRI) which included 12 factors proposed to evaluate the acceptability of CDRs.(34) Our findings were broadly consistent with this. The clinicians found the BASAT easy to use, useful to their practice, beneficial to their patients, acted as 'aide memoire' for CP, with clear wording and format. They agreed there was no other similar CDR currently in use; if the unit supported it, they could see robust evidence for the development and validation of the CDR, and brief training was provided, they would be more likely to use it.

Previous authors found that only 3% emergency physicians thought CDRs were too difficult to use, and 5% too time consuming, which is similar to our study, whereby 2% found our CDR too difficult to use and 7% too time consuming.(35) Graham et al also found that 81% of UK physicians preferred the term "guideline" to "rule".(35) Clinicians would use our CDR as a guide rather than a rule, with 31% having a proviso to using it; clearly, this CDR would not enable a 'diagnosis' of abuse or neglect, which requires a full multidisciplinary investigation of the family. Rather, it is intended to highlight those cases where maltreatment may be a cause, or where the child is living in a risky environment.

It was also clear that understanding how our CDR allocated a score of high, medium or low risk would be a major facilitator in its use. This is consistent with Ebben et al 2012, who conducted a survey of 303 ED nurses and doctors looking at factors that influenced the adherence to an ED protocol and found that if it is not clear to physicians why a recommendation is being made, they are less likely to follow it, and that they must accept the logic and the science of the rule.(36)

Limitations of this study include the fact that this CDR was still undergoing validation, and thus many staff were not aware of the strength of evidence behind it. In addition, we chose to categorise clinicians by their professional grade, but did not account for their years of experience, which may have been influential. There was a relatively small number of each grade of staff surveyed, as this was intended as an exploration of the rule's acceptability, to inform its implementation evaluation. While we explored the association between child protection training and clinicians assessment of potential maltreatment, those involved had undergone varying levels of CP training, which our small numbers did not allow us to account for. Also despite frequently conducting the survey out of hours, we were only able to sample a small number of temporary staff. These doctors are particularly important, as they may only cover the paediatric ED intermittently, with varying knowledge of paediatrics and maltreatment. As this was a service evaluation, we cannot know how a clinician would respond to cases in clinical practice; although it was clear that some health professionals were honest about their lack of intention to use the CDR.

In summary, previous research has focussed on whether clinicians use CDRs, and how widely disseminated they are, where as we have specifically explored whether or not they would actually follow recommendations of the CDR. Clinical judgment and acumen are clearly key to decision making, and therefore this CDR will be most useful to those with less experience of child protection and burns. However, it is of relevance to all clinicians' in order to minimise missing children who may have suffered maltreatment. To maximise the detection of children attending with injuries that may be due to maltreatment, developing validated CDRs will be an important component, but only if the staff in the departments understand and utilise such tools. This evaluation has highlighted that emergency departments introducing a CDR for burns, must ensure that all staff are aware of the tool, how it was developed and validated, and it should be clearly written and formatted. This is particularly important in departments with a high turnover of staff, or many junior staff.

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**Author contributions:** SM conceived the study, was involved in qualitative analysis and contributed substantially to the writing of the manuscript; ELJ designed the questionnaire, carried out interviews, managed the data and drafted the manuscript. LIH provided statistical advice, analysed the data and contributed to the writing of the manuscript. AMK revised the manuscript.

SM takes responsibility for the paper as a whole.

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