

Awareness Of Normal And Abnormal Physiological Parameters In Children: A Survey Of Staff Working In Southwest England

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Citation

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Abstract

A survey was carried out amongst clinical staff working on paediatric burns units in Salisbury, Bristol and Oxford. The main aim of the survey was to find out about how confident staff are in looking after children with burns injuries and how much formal training staff received. A secondary aim was to assess, via a series of scenarios, whether staff were able to pick up abnormal values for heart rate, systolic blood pressure or respiratory rate. The survey found that more than half of staff working on these units do not feel confident in managing children with burns injuries and that although staff are generally able to pick up abnormal physiological values, an abnormal heart rate is less likely to be recognised than an abnormal systolic blood pressure or respiratory rate. The authors of this paper would recommend that formal training is incorporated into the induction programme of new clinical staff and that all staff are provided with a table of normal ranges for physiological parameters.

INTRODUCTION

Burns are the third most common cause of injury-related death in children aged less than 9 years¹. The type of burn injury varies according to age group. Scalds are more common in toddlers whilst flame burns are more common in 6-10 year olds and both flame and electric burns cause the majority of burns in older children and adolescents². The Children's Burns Trust have reported that scalds from hot drinks are the cause of 50% of children admitted to hospital for burns injuries³.

Life-threatening consequences can arise as a result of a lack of vigilance and a lack of awareness of abnormal physiological parameters in children. The mortality in paediatric burns ranges from 0.2% to 10.2% as reported by Papp et al in 2008². Paediatric patients lack the reserves and resources of their adult counterparts and can deteriorate extremely quickly. Monitoring of the basic physiologic parameters such as heart rate, respiratory rate, blood pressure, temperature and urine output, along with appropriate and timely interventions can make a real difference in outcome to unwell children.

Burns and scalds in children require careful and precise fluid resuscitation, striking a balance between worsening oedema and hyponatraemia and maintaining intravascular volume for perfusion of vital organs. The Lund and Browder chart, developed in 1944, is widely considered to be the most

accurate for calculating total body surface area affected by a burn or scald injury. The Parkland formula is universally regarded as an appropriate guide to fluid resuscitation, although fluid regimens must be adjusted for each individual child according to response. A survey conducted in Germany in 2008 found that 78% of clinicians use the Parkland formula 'always' or 'often'⁵.

Children with severe burns in the UK are managed in specialist burns centres, ideally with an attached paediatric intensive care unit. Aggressive management in a specialised burns unit results in an excellent prognosis in children with large burns². Medical staff on these units, who are generally plastic surgeons or anaesthetists, should be trained to provide the best possible care for children after initial stabilisation at referring units. The need for this is reflected in the national service framework for the care of children which states that 'whatever the setting they work in, professionals are trained and competent to provide consistent advice and to assess and treat a child who is ill'⁶.

Children with burns are at risk of developing toxic shock syndrome (TSS), diagnosis of which is difficult in the early stages – and requires prompt detection and recognition in changes of the physiological parameters. Toxic shock syndrome (TSS) due to staphylococcal infection is a treatable condition with a mortality rate of up to 50% and where vigilance and early detection of abnormal physiology

has been shown to affect outcome⁷.

The Odstock Centre for Burns and Plastic Surgery in Salisbury, Wiltshire is a regional unit for providing specialist burns care for paediatric patients with mild to moderate burns. The unit is responsible for the care of (X) patients each year, of which (X) are paediatric burns patients. We surveyed staff on this unit and also in other units in region, to find out if clinical staff feel confident in providing care to children with burns injuries.

METHODS

A questionnaire was devised jointly by Paediatric and Plastic Surgery consultants. The questionnaire was aimed at doctors, nurses and health care assistants working on the burns unit. The main purpose of the questionnaire was two-fold. The first outcome was to find out about previous experience specific to both burns and paediatrics and resulting level of confidence of each staff member. The second section of the questionnaire involved the use of a set of scenarios designed to assess whether each staff member was able to recognise when a reading was outside the normal range for heart rate, respiratory rate or blood pressure. Respondents to the questionnaire were also asked to fill in basic information on their clinical role e.g. level of training for doctors, banding for nursing staff.

An example scenario was:

18 month old child with 8% scald to the right arm & chest from pan of water who has just received analgesia for a dressing change on the ward:

Heart Rate 135 (normal or abnormal)

Systolic Blood Pressure 90 (normal or abnormal)

Respiratory Rate 15 (normal or abnormal)

In this scenario, clearly the respiratory rate of 15 breaths/min is abnormal for an 18 month old child. Each respondent was expected to recognise this.

The questionnaires were mainly distributed to clinical staff working in Salisbury. A proportion of the questionnaires were distributed to staff working at Frenchay Hospital in Bristol and John Radcliffe in Oxford.

Demographic information was collated and presented in graph form. Responses to questions on previous experience were analysed quantitatively. Results for responses to scenarios were analysed separately and an overall impression was also obtained.

RESULTS

65 completed questionnaires were received. 47 (72%) were filled in by doctors ranging from foundation year doctors to

consultants. 13 (20%) were filled in by nurses band 5 and above. 2 (3%) were filled in by healthcare support workers. 3 (5%) people did not fill in their job description.

Respondents were asked if they had received any formal training in the care of children in this post. 20 respondents reported that they had received this but the majority (43 respondents) had not. Two people did not reply to this question.

Respondents were asked if they had any previous paediatrics experience. The majority of respondents had no previous paediatrics experience as shown in the graph below.

Figure 1

Paediatrics experience

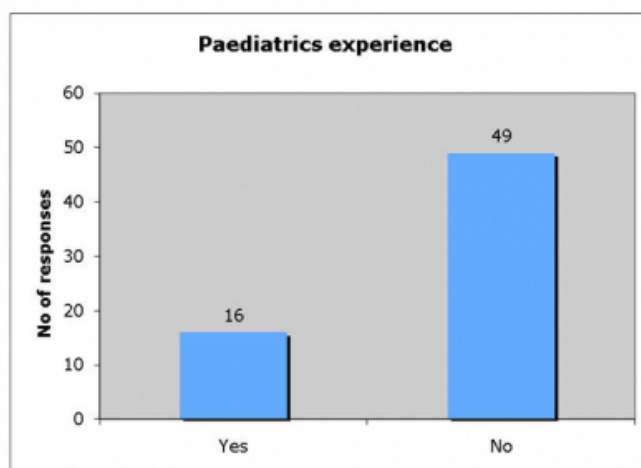
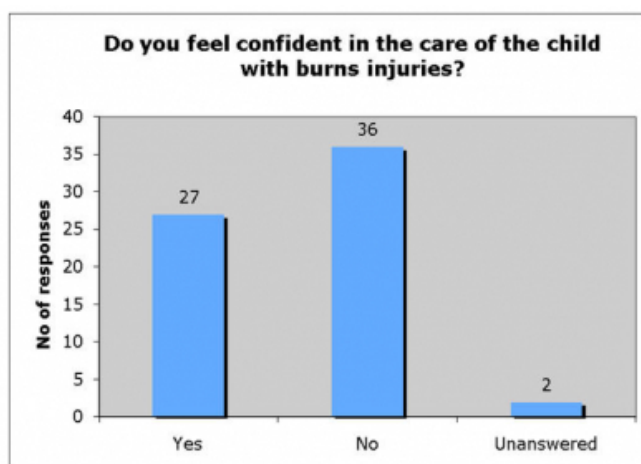


Figure 2

Respondents were asked if they felt confident in the management of children with burns injuries



More than half of the respondents reported that they do not feel entirely confident in managing children with burns. In the second section of the questionnaire, respondents were

given five scenarios and asked to report on whether they thought a given physiological value was normal or abnormal.

The first scenario was:

11 month old child admitted 30 mins earlier with 20% scald to the legs & lower abdomen from a hot bath:

Heart Rate 150

Systolic Blood Pressure 70

Respiratory Rate 35

Respondents were expected to recognise that this was a normal set of values for an 11 month old child. Most respondents recognised that normal values for heart rate and respiratory rate. However, only half of respondents recognised that a systolic blood pressure of 70 was normal for a child of this age.

The second scenario was:

18 month old child with 8% scald to the right arm & chest from pan of water who has just received analgesia for a dressing change on the ward:

Heart Rate 135

Systolic Blood Pressure 90

Respiratory Rate 15

As previously stated, although the heart rate and systolic blood pressure given are within normal limits, the respiratory rate of 15 is abnormal for an 18 month old child. The majority of respondents answered all three parts of the question correctly.

The third scenario was:

4 year old child with an 11% scald to the chest from a hot tap sustained 3 days ago and treated with Biobrane dressing 2 days ago:

Heart Rate 140

Systolic Blood Pressure 100

Respiratory Rate 25

The tachycardia is a potentially serious finding and could indicate septic shock and hypovolaemia. Again, most of the respondents answered all three parts of the question correctly.

The fourth scenario was:

10 year old child with 4% deep partial thickness contact burn from an iron sustained yesterday & dressed with Urgotul SSD:

Heart Rate 70

Systolic Blood Pressure 100

Respiratory Rate 20

The heart rate of 70 beats per minute is bradycardic for a 10 year old child and could possibly be a response to analgesia or severe sepsis. Most respondents answered all three parts

of the question correctly.

The fifth scenario was:

14 year old child with 12% full thickness flame burn from a bonfire sustained that day who has just returned from theatre for tangential excision & split skin grafting:

Heart Rate 100

Systolic Blood Pressure 105

Respiratory Rate 10

Respondents were expected to recognise that the respiratory rate is depressed and that the heart rate is within normal limits. Surprisingly, only half the respondents recognised the normal heart rate. The majority of respondents answered the other two parts to the question correctly.

Based on these responses, it would appear that an abnormal heart rate is the most difficult physiological parameter for clinical staff to recognise.

DISCUSSION

The majority of respondents to this questionnaire were doctors who had no previous paediatrics experience and no formal training in looking after children with burns injuries. Unsurprisingly, more than half (55%) of respondents to this questionnaire did not feel confident in looking after children with burns injuries.

Doctors within training posts, whether foundation or specialty doctors, rotate through each specialty over a period of 4 to 6 months. They are often not expected to have specialist knowledge but they are expected to be able to recognise and treat an unwell patient, manage fluid balance and escalate to seniors if concerned.

Recognising abnormal physiology in children is challenging because an awareness of normal ranges for various age groups is required and children can decompensate quickly when unwell. Doctors, however, do not work in isolation. Nursing staff, who more often than not are responsible for checking observations, are expected to inform doctors about abnormal findings. There are also scoring systems such as the Paediatric Early Warning Score (PEWS) which are designed to aid in early recognition of an unwell child. Based on the responses received to this questionnaire, it appears that clinical staff working on the specialist burns units previously mentioned are capable of recognising abnormal physiology, but are less likely to pick up an abnormal heart rate than other abnormal physiological parameters.

A limitation to this survey is that staff were not asked about other physiological parameters equally important in paediatrics patients with severe burns such as urine output

and, in the unwell child, central venous pressure monitoring. Also, the use of scenarios, although familiar to doctors, might not be the most effective way of testing knowledge and recognition in nursing staff and health-care assistants. Hence, a separate questionnaire could be developed for staff from these disciplines.

The use of a table of normal values is a reliable way of ensuring that clinical staff are aware of normal ranges for physiological parameters. Incorporating formal teaching during induction of new clinical staff is another potential method for increasing the confidence of staff managing paediatric patients with burns injuries.

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