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Too Hot to Handle: A Survey of Attitudes towards Fever of 462 Pediatric Intensive Care Unit staff.

Thomas Brick, MBBS MA[1]; Rachel S Agbeko, FRCPCH PhD [2]; Patrick Davies B MedSci BMBS[3]; Peter J Davis MB ChB [4]; Akash Deep, FRCPCH MD[5]; Peter-Marc Fortune, FRCPCH PhD [6]; David P Inwald FFICM PhD [7]; Amy Jones BN [1]; Richard Levin MRCP MSc [8]; Kevin P Morris FFICM MD [9]; John Pappachan FRCA [10]; Samiran Ray MBBChir MA [11]; Shane M Tibby MB ChB [12]; Lyvonne N Tume UKRN PhD [13] and Mark J Peters FRCPCH PhD [1,11] for the UK Pediatric Intensive Care Society Study Group (PICS-SG)

Author Information

1. Paediatric Intensive Care Unit, Great Ormond Street Hospital NHS Foundation Trust, London, UK

2. Paediatric Intensive Care Unit, Great North Children's Hospital, The Newcastle upon Tyne Hospitals NHS Foundation Trust, Institute of Cellular Medicine, Newcastle University, Newcastle, UK

3. Paediatric Intensive Care Unit, Nottingham Children's Hospital, Nottingham University Hospitals NHS Trust, UK

4. Paediatric Intensive Care Unit, Bristol Royal Hospital for Children, University Hospitals Bristol NHS Foundation Trust, UK

5. Paediatric Intensive Care Unit, King's College Hospital NHS Foundation Trust, London, UK

6. Paediatric Intensive Care Unit, Royal Manchester Children's Hospital, Central Manchester University Hospitals NHS Foundation Trust, UK

7. Paediatric Intensive Care Unit, St Mary's Hospital, Imperial College Healthcare NHS Trust, London, UK

8. Paediatric Intensive Care Unit, Royal Hospital for Children, Glasgow, UK

9. Paediatric Intensive Care Unit, Birmingham Children's Hospital NHS Foundation Trust, UK

10. Paediatric Intensive Care Unit, University Hospital Southampton NHS Foundation Trust, UK

11. Respiratory, Critical Care and Anaesthesia Unit, University College London Institute of Child Health, London, UK

12. Paediatric Intensive Care Unit, Evelina Children's Hospital, Guy's and St Thomas' NHS Foundation Trust, London, UK

13. School of Health, University of Central Lancashire, UK

Financial Disclosure and Conflict of Interest

TB, RSA, PD, PJD, AD, P-MF, DPI, AJ, RL, KPM, JP, SR, SMT, LNT, MJP declare no conflict of interest.

For information regarding this article, email thomas.brick@gmail.com

ABSTRACT

Objective: The role played by fever in the outcome of critical illness in children is unclear. This study aims to establish attitudes to management of children with fever and the use of acetaminophen (paracetamol) on United Kingdom pediatric intensive care units

Design: Self-administered electronic questionnaire.

Setting: 36 Pediatric Intensive Care Units and Pediatric Intensive Care Transport Teams in the United Kingdom.

Subjects: Medical and nursing staff working in United Kingdom Paediatric Intensive Care Units.

Intervention: None.

Measurements and Main Results: 462 United Kingdom pediatric intensive care medical and nursing staff responded to a web-based survey request. Respondents answered 8 questions regarding thresholds for temperature control in usual clinical practice, indications for acetaminophen (paracetamol) use, and readiness to participate in a clinical trial of permissive temperature control. The median reported threshold for treating fever in clinical practice was 38°C (IQR 38–38.5°C). Acetaminophen (paracetamol) was widely used as an analgesic and antipyretic but also for non-specific comfort indications. There was widespread support for a clinical trial of a permissive versus strict approach to fever in PICU. Within the context of a

trial, respondents were prepared to accept higher treatment thresholds for fever than in routine practice. 58% of respondents considered a temperature of 39°C acceptable without treatment.

Conclusions: The current approach to the management of fever by PICU staff was conservative. However there was a willingness within the UK PICU community to conduct a randomized controlled trial of fever in the PICU.

Key Words: Fever; Attitudes to Fever; Pediatric Intensive Care; Paracetamol; Acetaminophen; Medical Practices; Nursing Practices

Introduction:

Fever plays a central role in the host response to infection. Acetaminophen (paracetamol) inhibits immune responses to vaccination (1), increases the duration of time to crusting in chicken pox (2) and prolongs resolution of parasitaemia in children with malaria (3). Data from critically unwell adults suggest that febrile adults with infection have a lower adjusted odds of death compared with those who do not generate a febrile response (4). A study of critically ill adults demonstrated that the use of antipyretic treatment in sepsis is associated with increased mortality (5).

No guidance is offered on the use of antipyretics by international sepsis guidelines (6). Pediatricians have historically been reluctant to adopt a permissive approach to the management of fever (7) and international guidelines reflect this (8). No randomized controlled trials of antipyretic use in critically ill children have been published, however, recent UK guidance from the National Institute for Health and Care Excellence (NICE) recommends withholding acetaminophen (paracetamol) for

the sole purpose of reducing temperature in children presenting with a feverish illness (9).

Methods:

We devised a cross-sectional, self-administered electronic questionnaire designed to establish the current attitudes and practices relating to the management of fever and the use of acetaminophen (paracetamol) by medical and nursing staff working in pediatric intensive care in the UK. Invitations to complete the online questionnaire were distributed by email amongst members of the United Kingdom (UK) Pediatric Intensive Care Society (PICS) (518 members) and also emailed to individual pediatric intensive care units where the questionnaire was disseminated amongst the staff.

The survey was composed of 8 questions (see supplementary material). Questions 1 and 2 established the respondent's place of work and their professional role. Two questions were concerned with current clinical practice: one question established the threshold for treatment of fever in clinical practice and one question established the range of uses of acetaminophen (paracetamol) in clinical practice. One question was concerned with the recent NICE guidance. Three questions established the respondent's attitude to a clinical trial of permissive versus strict temperature control. Data were collected over a 3 month period March to May 2014.

Statistical Analysis:

Data are presented as medians and interquartile ranges where appropriate. Two sample comparison of medians were carried out with a 2-tailed Mann-Whitney U Test. Paired samples were compared using the Wilcoxon Signed-Rank Test.

Statistical analysis was conducted with SPSS software (version 22, IBM, Chicago, IL).

Results:

Place of work and professional role

There were 462 respondents of which 291 were nurses and 171 doctors. The membership of PICS is 518, however the invitation to answer the questionnaire was more widely distributed and the precise response rate is therefore not known. Staff from 35 pediatric intensive care units, or pediatric intensive care transport teams, in the UK responded. 261 respondents were classified as 'junior' (junior nursing staff, or doctors in training) and 201 were 'senior' (charge nurses, or consultants). The completion rate was 90%.

Current practice

The median temperature at which respondents attempt to lower temperature in their routine clinical practice was 38°C (IQR 38–38.5°C). This threshold was higher in doctors than in nursing staff (38.5°C IQR 38-39°C vs 38.0°C IQR 38-38.5°C, $p<0.001$) and higher in senior staff than in junior staff (38.5°C IQR 38-39°C vs 38.0°C IQR 38-38.5°C, $p<0.001$). Junior nurses were the most conservative group with a median threshold of 38.0°C (IQR 37.75-38°C). Senior doctors were the most permissive with a median threshold temperature of 39°C (IQR 38.5-39°C) (Fig 1).

Indications for the use of acetaminophen (paracetamol) were described (Fig 2). On UK PICUs, acetaminophen (paracetamol) was frequently used as an analgesic and for the treatment of fever. (Mean Likert scores 1.3 and 1.5, where 1=Very Frequently, 2=Frequently, 3=Occasionally, 4=Rarely and 5=Very Rarely). It was used uncommonly for endotracheal tube tolerance and sedation (mean Likert scores 3.6

and 4.0). It appears to be commonly used for ‘general discomfort’ (mean Likert score 2.0).

Attitudes towards a change in practice

We used a 5 point Likert rating scale to establish whether respondents thought their PICU would adopt the NICE guidance advising that acetaminophen (paracetamol) not be used with the sole aim of reducing body temperature. Only 29.5% of respondents thought it was likely or very likely that their unit would adopt the NICE guidance. Senior doctors were the most skeptical regarding adoption of the NICE guidance (likely and very likely = 21%), and senior nurses were the least skeptical (likely and very likely = 33.3%).

The most common response was “neutral” (37.5% of responses). Across all the professional groups, less than 5% of respondents thought their unit was very likely to adopt the NICE guideline.

92% of respondents reported being keen for their intensive care unit to participate in a randomized trial of permissive versus strict temperature control.

Trial thresholds

Within the context of a proposed trial, we established the highest acceptable temperature without treatment – what would be in practice the ‘permissive arm’ of a clinical trial (see Fig 1). The median highest acceptable temperature for all respondents was 39 °C. 81% of respondents considered a temperature of 38.5°C and above acceptable without treatment. This dropped to 58% at 39°C and above, and 30% at 39.5°C and above. Only 17.5% of respondents considered a temperature of 40 °C acceptable without treatment.

Within the context of a proposed clinical trial, the median acceptable treatment threshold was higher for doctors than for nurses (39.5°C (IQR 39-40°C) vs 38.5°C (IQR 38-39°C), $p<0.001$). There was no difference between the median temperature thresholds for senior staff and junior staff (39.0°C IQR 38.5-39.5°C, $p=0.018$).

The median acceptable treatment threshold was higher in a trial context (39°C) than in routine clinical practice (38°C). The finding was consistent across all professional groups (Fig 1): Junior Nurse: 38.5°C vs 38°C, Senior Nurse 39°C vs 38°C , Junior Doctor 39°C vs 38.5°C, Senior Doctor 39.5°C vs 39°C ($p< 0.001$ for all comparisons with Wilcoxon signed rank test).

Alternatives to acetaminophen (paracetamol) for analgesia

Respondents were asked whether, within the context of a clinical trial, they would agree to use forms of analgesia that are acetaminophen-free (paracetamol-free). Two thirds (67%) answered Yes, one third (33%) answered No. The differences between professional categories are marked. Senior nurses were the most likely to accept alternative forms of analgesia (78%) whilst junior doctors were the most cautious about using non- acetaminophen (paracetamol) analgesia (51%).

Discussion:

Despite the absence of evidence that treating febrile children in intensive care with acetaminophen (paracetamol) is of benefit, attitudes to the management of fever by health professionals in PICUs remain non-permissive with a median treatment threshold of 38 °C in clinical practice. We have observed that a more permissive attitude to temperature control was associated with increasing seniority and being a doctor.

Skepticism was present amongst the survey respondents regarding the likely adoption, within an intensive care setting, of the recent NICE guidance restricting the use antipyretics. Senior doctors appear to be the most skeptical group. Acetaminophen (paracetamol) was frequently used as both an analgesic and an antipyretic by respondents in this survey. We also demonstrated the use of acetaminophen (paracetamol) for a wide range of indications – including general discomfort and endotracheal tube tolerance. This may explain the degree of skepticism towards a change in practice.

There was enthusiasm, within the UK PICU community for a randomized controlled trial of permissive temperature control. Within the context of a trial, respondents were willing to accept a higher median treatment threshold than in routine practice. Again, doctors accept higher treatment thresholds than nurses, although seniority was not found to be related to a more permissive attitude.

Such attitudes to fever are long-standing. In our cohort they may be due to the influence of avoidance of hyperthermia in low cardiac output states (10) and in traumatic brain injury (11). In addition, parental anxiety towards fever in children is well documented (12).

Our study has confirmed widespread variability in practice thresholds for temperature control in PICU. The current variability in attitudes and practices implies the existence of clinical equipoise amongst the PICU clinicians, and indicates the need for, and feasibility of, a randomized controlled trial of strict versus permissive temperature control.

Tables

Figure 1: Plot of thresholds at which respondents lower, both in clinical practice and in the context of a trial. (Whiskers are at 1.5 x interquartile range, the solid box includes 25th to 75th centile, and the dark line is the median, dots are outliers).

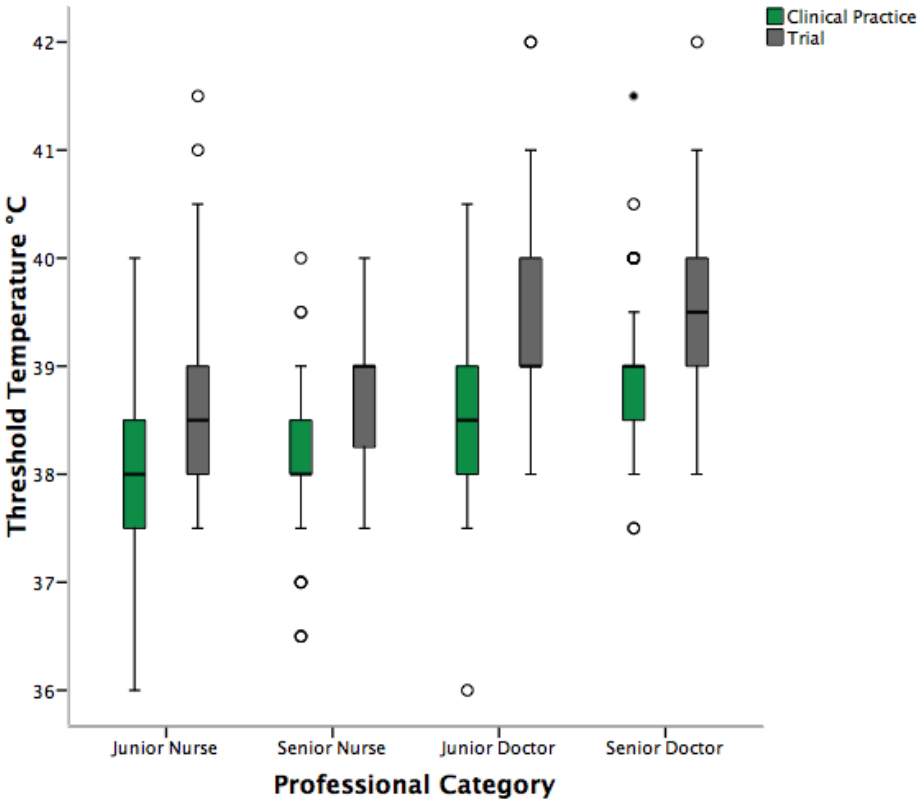


Fig 2: Uses of acetaminophen (paracetamol) in PICU:

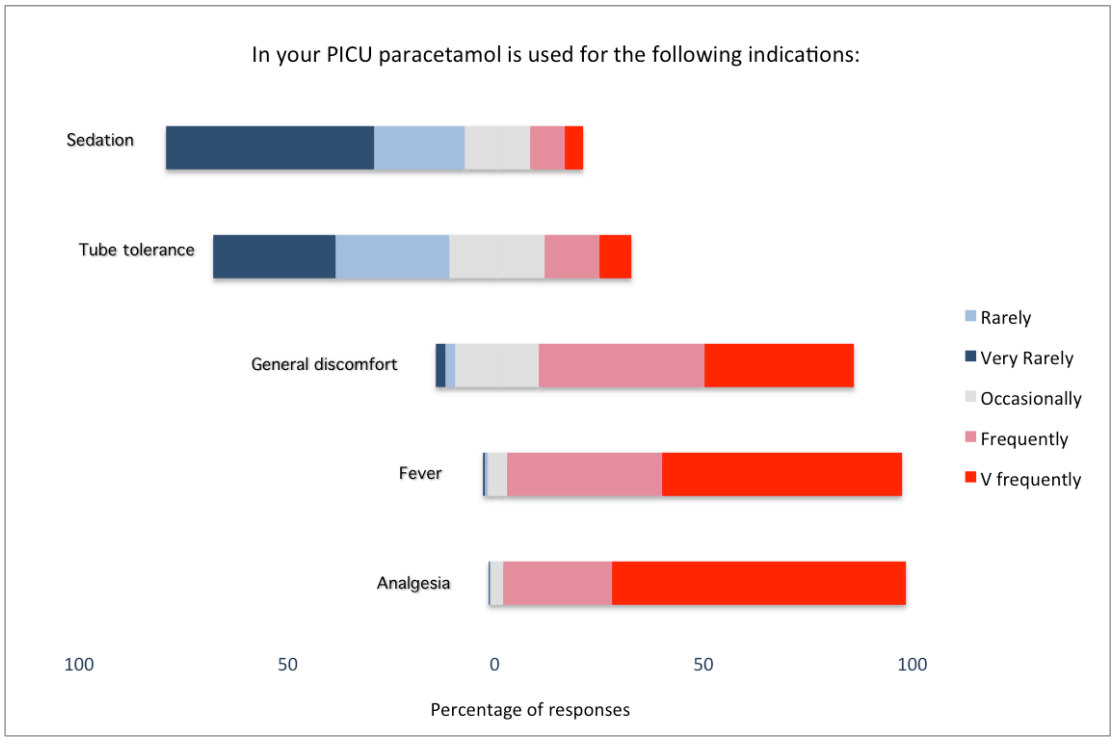


Figure 3: Histogram of threshold at which temperature respondents would attempt to lower temperature in routine clinical practice. Percentages refer to the percentage of respondents at or above a temperature threshold.

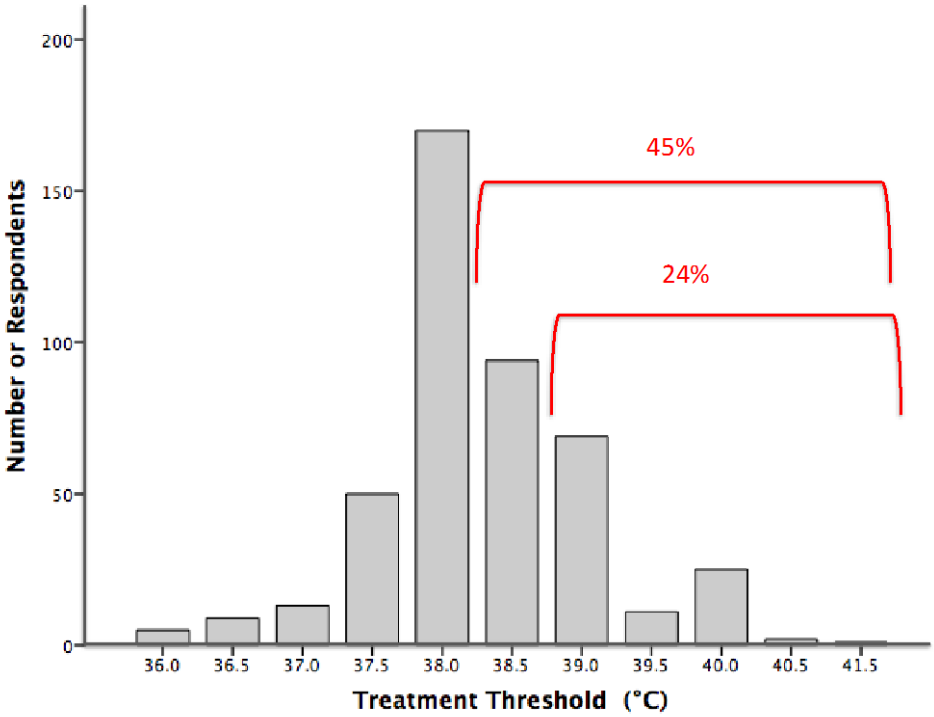
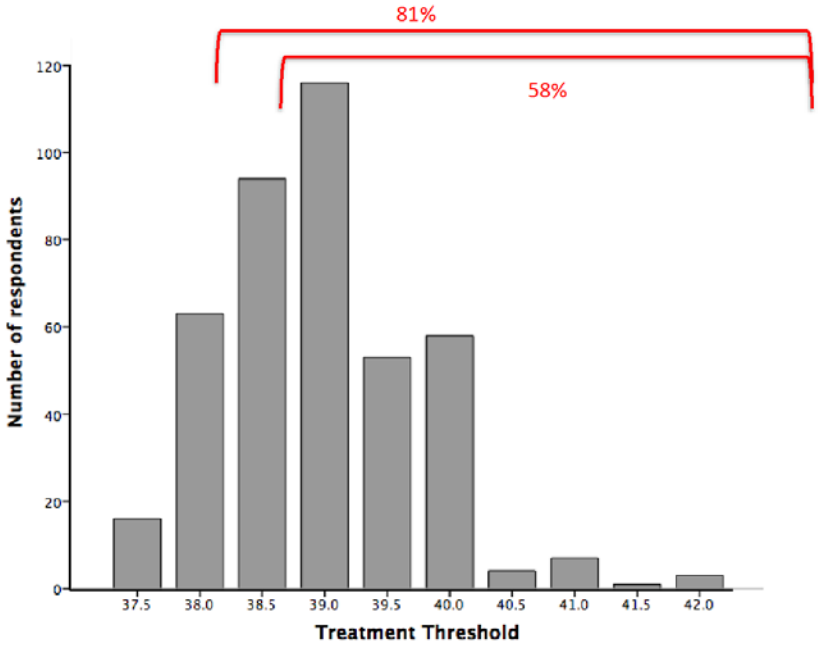


Figure 4: Histogram of highest acceptable temperature without treatment, within a clinical trial. Red percentages refer to percentage of respondents at or above a temperature threshold**.**



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Supplementary Material

1. Which unit or transport team do you work for?
2. What is your role in PICU?
3. You are caring for a child who requires intensive care due to a confirmed, or suspected, infection. The child has no specific indication to maintain normothermia (i.e. there is no head injury, encephalopathy or low cardiac output state). At what threshold would you attempt to lower the temperature in such a child?

37.5°C	38°C	38.5 °C	39°C	39.5°C
40°C	40.5°C	41°C	41.5°C	42°C

4. In your PICU paracetamol is used for the following indications:

	Very frequently	Frequently	Occasionally	Rarely	Very rarely
Analgesia					
Fever					
General discomfort					
Tube tolerance					
Sedation					

5. The 2013 update to the NICE guideline ‘Feverish Illness in Children’ states: Do not use antipyretic agents with the sole aim of reducing body temperature in children with fever. What is the likelihood of your PICU accepting this recommendation?

Very unlikely	Unlikley	Neutral	Likely	Very likely

6. Would you be keen, in principle, for your unit to participate in a multicentre randomised controlled trial of permissive versus strict temperature control in children receiving intensive care?

Yes	No

7. Patients in the permissive arm of the trial will be permitted to have a higher temperature than in the strict arm before intervention is indicated. What is the highest temperature you would consider acceptable without treatment?					
Up to:	37.5°C	38°C	38.5 °C	39°C	39.5°C
	40°C	40.5°C	41°C	41.5°C	42°C

8. Imagine this scenario: Your patient is entered into the trial. He or she is febrile, but does not reach the threshold for treating fever within the trial protocol. He or she is also in pain, and you would like to give some analgesia. In this scenario, would you agree to use only non-paracetamol forms of analgesia?	
Yes	No