A survey on fever management practices among pediatric nurses in three regional acute hospitals in Hong Kong

Leung Luk Yin Ha Ha* Siu Mai Hui**

Abstract Aims: To find out if warm bathing is still in use to reduce fever and the rationales behind it. Method: A cross-sectional survey using a self-designed questionnaire was adopted. 113 pediatric nurses in three regional hospitals answered the questionnaire. Results and discussion: It shows that warm bathing is ranked the third commonly used method for fever management in wards. 62% of respondents use "a routine practice for high fever" as one of their rationales for warm bathing and that may hinder their assessment of individual patient. Conclusions: Based on all information obtained, possible reasons for why warm bathing is still in use in nursing practice are discussed and several implications for nursing practice are also presented.

Key words Childhood fever Fever management Tepid sponging Warm bathing

Fever has long been recognized as a symptom and not a disease itself. It has been estimated that up to 20% of emergency department visits are children having fever and seeking for treatment (Felter & Bower, 1997) and about 30% of patients seen by pediatricians with their primary complaint is fever in United States (Van der Jagt, 1997). Furthermore, parents are usually too anxious about what harm may fever cause even though their children only suffer from minor illnesses (Crocetti, Moghbeli & Serwint, 2001; Karwowsha, Nijssen-Jordan, Johnson & Davies, 2002; Walsh & Edwards, 2006). Therefore, fever as a symptom in children and its management is a concern to both healthcare professionals as well as parents.

Fever (pyrexia) is defined as an abnormal increase in body temperature - above 37.5°C orally (Porth, 1994). However, there is a normal diurnal variation in children up to 1.1°C. Under normal circumstances, human beings are capable of maintaining a normal range of internal body temperature that is called the "set point". It is defined "not as a specific temperature but rather as a range of temperatures (approximately 36.2 to 37.8°C) above or below which compensatory warming or cooling mechanisms are activated" (Holtzclaw, 1992). When body temperatures rise over the upper limit of the set point, heat-loss mechanisms include vasodilation and sweating are activated. While vasoconstriction and shivering are the warming mechanisms when the lower limit of the set point is reached.

Author address: Kiang Wu Nursing College of Macau
* Prince of Wales Hospital, Hong Kong
* * Shatin Hospital, Hong Kong

Fever is induced by a variety of pyrogens such as infectious organisms, toxic drugs, chemical compounds, blood products, neoplastic cells, and foreign bodies etc. One of the prevailing explanations of fever is that the pyrogen is thought to cause the thermostatic center of the hypothalamus to reset the set point at a higher level than normal. The existing body temperatures are then sensed to be too cool with an elevated set point. The warming mechanisms, shivering and vasoconstriction, are activated to prevent heat loss (Kluger, 1991).

Studies have shown that fever runs a dynamic course of three distinct phases. The initial phase is the chill phase. With the new set point, the febrile person feels cool and the body reacts by chilling and vasoconstriction in generating heat. A plateau phase then follows in which the temperature is maintained at the higher level of the new set point. When the rising temperature exceeds the upper limit or the endogenous pyrogen levels fall, the body reacts by vasodilation and sweating in losing heat, which is called the defervescence phase (Holtzclaw, 1992). This dynamic temperature curve of fever is different from hyperthermia which is a unresolved linear rise of temperature. Hyperthermia is a state in which a person has a sustained elevation in body temperature(more than 37.8°C orally or 38.8°C rectally) (Carpenito, 1989). Hyperthermia involves dysfunction of the normal thermoregulatory ability which may be due to excessive environmental heat or hypothalamic injury. Prompt and aggressive action must be taken to cool the patient to prevent irreversible denaturation of cell proteins as core temperature approach 40°C (Holtzclaw, 1992).

1. Literature review

Management of fever

Three ways of management of fever are usually recommended in recent medical and nursing literatures including administration of antipyretics, maintenance of hydration and external cooling measures (Axelrod, 2000; Barkin, 1997; Hockenbery & Wilson, 2007; Schmitt, 1999; Schwartz, Curry, Sargent, Blum & Fein, 1997; Wong & Wilson, 1995). Concerning the antipyretic therapy, though it is well documented about its effectiveness in lowering down body temperature without many side effects, there are still two approaches for its administration for the management of fever. One approach is to adopt an early and vigorous treatment for patient comfort and febrile seizures prevention. While another approach is to wait and see since fever is the body adaptation to fight infection (Schwartz et al, 1997). However, the middle approach is not to treat if temperature less than 38.5°C unaccompanied by apparent discomfort and to administer acetaminophen (15 mg/kg q 4 to 6 hour PO or PR) with temperatures > 38.5 to 39°C (Felter & Bower, 1997).

Regarding to the external cooling measures, there are direct methods including cool baths, tepid sponging, cool flannels, ice packs and removing clothing, Indirect methods include the use of fans and reduction of room temperature. Referring to literatures, there are different opinions about the use of tepid sponging as a kind of intervention. Some authors recommend sponge bathing in tepid water to reduce temperature beyond antipyretic therapy (Barkin, 1997; Schwartz et al., 1997). Several authors recommend sponging only if the child does not respond to antipyretic medications (Kimmel & Gemmill, 1988; Kruse, 1988) Sloane and Slatt (1993) suggested sponging with tepid water only as an emergency measure to lower a temperature of at least 41°C. The reason is that if the set point is not first lowered by antipyretic drug, external cooling increases the metabolic rate, shivering and discomfort can result in "rebound" temperature elevation after the sponging.

In recent medical and nursing literatures, sponging as a kind of fever reduction is discouraged except those with neurologic disorder that affects self-thermoregulatory mechanism and responds poorly to antipyretics. "Cooling procedures such as sponging or tepid baths are ineffective in treating febrile children except for hyperthermia" (Wong & Wilson, 1995). "Sponging as a method of fever reduction usually adds nothing other than discomfort when used with previously well infants or children with non-life-threatening fever" (Engler & Rushton, 1996). Some pediatricians even argue fever intervention may interfere with the beneficial role of fever during illness and consequently adversely affect the outcome of the illness. Physical cooling methods were found to potentially increase the breakdown of body energy and induced shivering (Mackowiak & Plaisance, 1998). "Patients are often actively cooled, which may be counterproductive because decreasing skin temperature increases the thermoregulatory core target temperature. Cooling may also provoke metabolic and autonomic stress and thermal discomfort" (Lenhardt et al., 1999). On a middle approach, Schmitt (1999) suggested that sponging is usually not necessary to reduce a fever. Only when the child is uncomfortable and the fever is still staying high over 40°C after taking the acetaminophen for 30 minutes, sponge bath may be given. However, during the sponging process, shivering must be avoided since it will produce heat and a temperature increase.

Studies related to Tepid Sponging or warm bathing

A search of the CINAHL, PsycINFO and PsycARTICLES databases with terms tepid sponge or warm bathing, randanized control trial or systematie review, fever and child from 1997 to 2007 was conducted. 25 articles were obtained with 3 articles relating to RCT were selected for further review. Sharber (1997) conducted random controlled trial in accident and emergency department with 20 children aged from 5 to 68 months with fever equal to or greater than 38.9°C. Children were randomly assigned to acetaminophen alone or acetaminophen plus a 15-minute tepid sponge bath. Results showed that sponge-bathed subjects cooled faster during the first hour, but there was no significant temperature difference between the groups over the 2-hour study period. On the other hand, subjects in the sponge bath group had significantly higher discomfort scores. Each sign of discomfort including crying, shivering,

and "goosebumps" was given a score of "1". There was a possible discomfort score range of 0 to 3. In a systematic review conducted by Watts, Robertson, Thomas. (2001) on 10 studies, results suggest that there is little if any benefit from sponging in temperate climates. In addition, there is a significant risk of increasing discomfort, which in turn may raise the child's temperature. They further suggest having studies on sponging in the management of moderate fever in children in non-tropical environments. In another systematic review conducted by Meremikwu and Oyo-Ita, (2004) on seven randomized and quasi-randomized controlled trials to evaluate the benefits and harms of physical cooling methods used for managing fever in children, only three small trials showed sponging had antipyretic effect on children who had already been given antipyretics. However, the intervention also caused shivering and goose pimples. This review concluded that only a few small studies demonstrated that tepid sponging helps to reduce fever in children.

Referring to the recent nursing literature and research in the management of fever for children, it is suggested that tepid sponge or warm bathing is not an effective intervention to reduce fever; furthermore, it may cause additional discomfort and distress to the febrile children. The research questions of this study are: Are pediatric nurses in Hong Kong still using warm bathing in the management of fever of pediatric patients? What are their rationales behind? Do they find it effective in reducing temperature? Are there any discomfort observed? Based on these questions, the objectives of this study are: 1) to find out the ways pediatric nurses manage fever of pediatric patients; 2) to understand their rationales for fever management practices; 3) to examine the practice of warm bathing and its rationale; and 4) to study the effectiveness of warm bathing.

2. Method

This was a cross sectional descriptive study to examine the fever management practices of pediatric nurses in three regional acute hospitals in Hong Kong. A self-designed questionnaire with face validity was used. Fourteen questions on usual practice on fever management, most frequently used methods, observed and perceived effectiveness, and 7 questions on demographic data were asked. The tool was pilot-tested for readability with 10 pediatric nurses from three sampled hospitals and revised. All pediatric nurses with different ranks working in the pediatric wards of these hospitals were invited to answer the questionnaire. Voluntary bases and strict confidentiality were ensured. Verbal consents were obtained. One coordinator from each hospital was invited to distribute and collect the questionnaire. Descriptive statistics were used with the help of statistical package SPSS version 10.

3. Results

A total of 121 questionnaires were sent out with 113 returned. The response rate was 93.4%. The age ranged from 21 to 40. Forty five percents of respondents were single and 55% were married. Among them, 62.7% had children. Most of them (82.6%) were registered nurses. 53.6% worked in nursing more than 10 years. 65.1% had a bachelor degree in Nursing and 65.5% completed pediatric training. Details can be seen in Table 1.

Nursing practices of fever management

83.9% of respondents responded that there are nursing protocols or guidelines available in their units for fever management. Table 2 shows the usual practices of fever management and their most frequent used methods. The usual nursing practices of fever management included removal of thick clothing (100%), encouraging fluid intake (99.1%), warm bathing (89.4%), tepid sponging (76.1%), use of ice bag (69.9%), keeping cooler room temperature (38.9%), use of antipyretic drugs (31.9%), use of fan (9.7%) and cool bathing (5.3%). The most frequent used methods in order of ranking were removal of thick clothing, encouraging fluid intake, warm bathing and tepid sponging.

When asked about the key rationales behind for implementing fever intervention, their responses were as follows: 1) to increase comfort (91.1%); 2) to prevent seizure (87.5%); 3) to reduce fever (75.9%) and 4) to prevent rise in fever (62.5%). Their responses to the major factors influencing fever management practices

were 1) departmental protocol/guidelines (70.8%); 2) physician practices (68.1%); 3) routine practice (64.6%).

Table 1 Demographic data (n=113)

	Number	Percentage(%)
Age: 21~25	19	17.8
26~30	22	20.6
31~35	20	10.7
36~40	36	33.6
over 40	10	9.3
Marital status:		
Single	50	45
Married	61	55
Having children:		
Yes	41	37.3
No	69	62.7
Ranks:		
Nursing Officer or above	15	13.8
Registered Nurse	90	82.6
Enrolled Nurse	4	3.7
Number of years in Nursing:(excluding student)		
Less than 1 year	2	1.8
1~5 years	30	27.3
6~10 years	19	17.3
over 10 years	59	53.6
Number of years in pediatric specialty:		
(excluding nursing training)		
Less than 1 year	11	9.9
1~5 years	31	27.9
6~10 years	33	29.7
over 10 years	36	32.4
Academic nursing qualification:		
Certificate in nursing	25	22.9
Diploma in nursing	12	11.0
Bachelor degree in nursing	71	65.1
Master in Nursing	1	0.9
Any pediatric specialty training:		
Yes	72	65.5
No	38	34.5

Regarding the use of warm bathing as a kind of fever management, 105 nurses (94.6%) had used warm bathing to manage fever in their respective units. In response to when the warm bathing will be performed, 47 nurses will use with tympanic temperature at or over 38°C; 21 with oral temperature at or over 38°C; and seven with rectal temperature at or over 38°C. The rationales nurses reflected on for deciding when to perform warm bathing were as follows: 1) prevention of seizures (63.9%); 2) routine practice for high fever (62%); 3) rapid cooling (57.4%); and 4) fever not responded to antipyretics (52.3%). Registered nurses (80.2%) or relatives (59.4 %) mostly initiated the warm bathing. Regarding the performing of warm bathing, mostly it was done by relatives (89.7%), then healthcare assistants (72.9%), registered nurses (64.5%) and enrolled nurses (48.8%).

Table 2 Usual practice on fever management and their most frequently used methods

	Methods to be used (n=113)		Rank
	n	%	
Removal of thick clothing	113	100.0	1
Encouraging fluid intake	112	99.1	2
Warm bathing	101	89.4	3
Tepid sponging	86	76.1	4
Use of ice bag	79	69.9	
Keeping cooler room temperature	44	38.9	
Use of antipyretic drugs	36	31.9	
Use of fan	11	9.7	
Cool bathing	6	5.3	

Effectiveness of warm bathing on febrile children

When asked about the observed effectiveness on febrile children having a warm bathing, during the procedure with usual length around ten minutes, 68 respondents (63%) claimed to have observed shivering, 54 (51.4%) observed more anxiety and 65 (62.5%) observed they were more enjoyable. Regarding observation after the warm bathing, 105 respondents (99.0%) found that the children were more comfortable. 101 respondents (94.4%) reported the temperature was reduced, 55 respondents (52.4%) found the temperature were up again and 16 respondents (15.7%) responded there were febrile seizures.

With regard to advice to relatives for fever management, beyond removal of thick clothing, encouraging fluid intake (98.2%) and seeking medical advice (96.5%), warm bathing (89.4%) is ranked the third method to be recommended. Regarding the methods for own use, the most frequent used methods in order of ranking were removal of thick clothing (99.0%), encouraging fluid intake (99.0%), warm bathing (87.4%), seeking medical advice (84.7%), self prescription of antipyretics (71.2%), keeping cooler room temperature (63.1%), tepid sponging (56.8%), use of ice bag (47.7%) and use of fan (18.9%). Relating to its perceived effectiveness, the ranking were removal of thick clothing (77.5%), encouraging fluid intake (76.6%), warm bathing (67.7%), self prescription of antipyretics (61.3%), seeking medical advice (55.9%), keeping cooler room temperature (45.0%), tepid sponging (39.6%), use of ice bag (29.7%) and use of fan (18.9%). Details can be seen in Table 3.

Table 3 Fever management methods for own use and their perceived effectiveness

	Methods to be used (n=111)		Effectiveness	
	n	%	n	%
Removal of thick clothing	110	99.0	86	77.5
Encouraging fluid intake	110	99.0	85	76.6
Warm bathing	97	87.4	75	67.6
Seeking medical advice	94	84.7	62	55.9
Self prescription of antipyretics	79	71.2	68	61.3
Keeping cooler room temperature	70	63.1	50	45.0
Tepid sponging	63	56.8	44	39.6
Use of ice bag	53	47.7	33	29.7
Use of fan	29	18.9	21	18.9
Cool bathing	1	0.9	1	0.9

4. Discussion

Recent literatures and research suggest that tepid sponging or warm bathing is discouraged or ineffective except those with neurologic disorder. However, they are still the usual nursing practices in the pediatric wards in these hospitals. They are the third most frequent used methods after removal of thick clothing and encouraging fluid intake. Besides, nurses also use warm bathing as one kind of fever management methods for their own children and provide the same advice to patients' relatives and their own. It is consistent with the review by Holtzclaw, (2003) that healthcare professionals attitude about fever have failed to keep pace with the new findings about fever dynamics, such as high body temperature as a protective host response (Jiang et al., 1999); cool measures as counterproductive (Holtzclaw, 1998; Lenhardt et al., 1999) and the body as a natural regulator (Kozak et al., 2000). On the contrary, cooling interventions remain popular (Grossman, Keen, Singer & Asher, 1995; Jones, 1998).

With respect to the key rationales behind for fever intervention, more than 90% of the respondents perceive that they can increase comfort, 75.9% think that it can reduce fever, however, on the contrary, recent nursing literatures suggest that warm bathing as a kind of fever management practices may add discomfort and are ineffective in treating febrile children except for hyperthermia (Engler & Rushton, 1996; Hockenberry & Wilson, 2007; Wong & Wilson, 1995). With regard to using specifically warm bath for reducing fever, 63.9% of respondents (69) think that warm bathing can prevent seizures. However, it has been recognized by many pediatricians that neither antipyretic therapy nor sponge baths can prevent febrile seizures (Kayman, 2003; Wong et al., 2001). Furthermore, 62% of respondents (67) use "a routine practice for high fever" as one of their rationales for warm bathing and that may hinder their assessment of the needs of individual patient. Schmitt (1999) suggests warm bathing may be given to the child who is uncomfortable and does not respond antipyretic medications after 30 minutes with fever over 40°C. Therefore, more detailed criteria could be provided for those who really need warm bathing to avoid misuse of manpower and more significantly induce discomfort. For instance, it would be inappropriate to perform a warm bathing when the patient is in a state of chill and vigor.

Though warm bathing is a usual practice for fever management and mostly initiated by nursing staff, quite a large number of relatives request the procedure and in fact, the warm bathing is done by them. There might be several possible reasons for using warm bathing. First, it is a common practice in the ward. Second, relatives can participate in the caring process that would make them feel better in enhancing the recovery of their sick children. Third, it is a common belief that warm bathing can help increase comfort and reduce high temperature, which is also supported by healthcare professional staff. A study by Karwowsha et al. (2002) demonstrated that fever phobia exists among parents and healthcare providers and is most likely in parents of febrile children and family physicians. Parents were most concerned about discomfort, seizures and dehydration and most physicians were concerned about dehydration and seizures. Therefore many of them are eager to control fever and not recognize that for most illnesses which cause fever (especially in people who do not need hospitalization), fever is probably beneficial and should not be treated with antipyretic agents nor physical cooling methods (Engler & Rushton, 1996; Kluger, Kozak, Conn, Leon, Soszynski, 1998; Mackowiak, 1998; Schwartz et al., 1999). One local survey found that 72.3% of respondents who were parents or guardians of children under the age of 14 presenting with febrile illness in the emergency department of a local hospital felt that bathing or

sponging should be performed (Ng , Wong, Lau & Kwok, 1999). Furthermore, the authors of the study including 3 doctors and a nurse also considered the tepid sponge bathing as an effective means in cooling the child with high fever.

Regarding the observed effectiveness of warm bathing on febrile children, though 101 respondents (94%) reported the temperature was reduced, 55 respondents (52.4%) found the temperature were up again. Furthermore, more than half of the respondents observed discomfort of children during warm bathing in terms of shivering and increase of anxiety. They are consistent with some recent studies that there is little benefit from warm bathing and a significant risk of increasing discomfort (Sharber, 1997; Watts, et al., 2001). On the other hand, 99% of the respondents observed that children were more comfortable after the warm bathing. It may be due to the completion of the procedure and the temperature is temporarily reduced (Sharber, 1997).

With respect to the perceived effectiveness of warm bathing, more than 80% of respondents use warm bath as one of the methods of fever management for their own children and relatives and 67.6% perceive that it is effective. It shows that the use of warm bath is also influenced by their past experiences. However, the effectiveness of warm bathing perceived might be presented as a temporary reduction in temperature and psychologically release of burden since something has been done to hasten the recovery of the illness. Therefore, unless there is strong evidence to convince the healthcare professionals that warm bath is ineffective, the pediatric nurses will certainly continue to use this method.

5. Conclusions

Based on all information obtained from this study, several possible reasons why warm bath is still in use in clinical practices are to be explained. First, it is a routine practice in wards and is written in nursing protocols and guidelines. Second, most of the nurses use warm bath for their relatives and own children who have high fever and many of them get positive effects in reducing temperature temporarily after bathing. Third, it is a common belief that warm bath is effective in increasing comfort and reducing temperature, which is also supported by medical professionals and relatives. Fourth, not all children taking warm bathing will have discomfort in terms of shivering and crying that may trigger the needs of changing the usual practice. Finally, there is scanty research on this subject in local context that can generate discussion of the related issue.

The present study carries several implications for nursing practice. First, most of the staff, 70.9% (78) have been in nursing over six years, they may not have the updated knowledge of fever management. The present literatures and research about fever management and particularly warm bathing should be reviewed so that pediatric nurses can keep abreast of the recent changes of the practices. Second, the recent fever management protocols and guidelines should be rewritten with the most updated knowledge and evidence. With sufficient evidence, those febrile children who really need warm bathing should be identified as recommended by the research studies. Third, a small-scale study on the effectiveness of warm bathing should be conducted to provide evidence for change in the local context. Finally, with the support from management and local university, a more vigorous study such as a randomized control trial can be conducted to provide more evidence in supporting the change.

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香港三家區域性急症醫院兒科護士發熱處理的調查研究

陸 亮 夏燕霞* 許笑媚**

摘要 目的：本研究旨在找出溫水浴是否仍然在運用以及它背後的基本原理。方法：本調查採用自行設計的問卷作現況式調查。三間地區醫院共113名兒科護士參予了回答問卷。結果：調查顯示，在病房發熱控制方面，溫水浴是第三種最常用的方法。百分之六十二的答卷者選擇"常規操作處理發燒"作為溫水浴的基本護理。但那有可能妨礙他們對個別病人的評估。結論：在所得資料的基礎上，我們對所有為什麼護理行業仍然使用溫水浴處理發燒病人進行了探討，並對此提出了一些相應對策。

關鍵詞 小兒發燒 發燒處理 溫水浴