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Management of Childhood Fever by Parents: A Literature Review

INTRODUCTION

Having a sick child is an anxious time for parents who are frequently very concerned about their child and have difficulty assessing the severity of the illness (Kai 1996a). One of the main indicators of an illness is fever. Many parents consider fever to be harmful (Crocetti *et al.* 2001) and a disease in itself (Singhi *et al.* 1991). Parents often feel disempowered when their child is ill and that they are not caring appropriately for their child if they do not treat the fever (Kai 1996a). A number of articles describing parents' concern about and inappropriate management of fever have been published in the medical literature over the past few decades. Educational programs developed to assist parents manage childhood fever have proven effective. (Casey *et al.* 1984, Crocetti *et al.* 2001, Sarrell & Kahan, 2003). Yet, parents remain concerned about and mismanage fever. They seek information about fever management and reassurance for their management practices from family, friends, health professionals, books, magazines and the Internet (eg., Impicciatore *et al.* 1998, Crocetti *et al.* 2001, Allen *et al.* 2002, Karwowska *et al.* 2002).

Medical literature interest in parents' management of fever appears to have originated from an article written by Schmitt in 1980 (1980) where he coined the phrase 'fever phobia' to describe parents' unrealistic fears about fever. Since this time parents' fever phobia, confirmed by their overuse of medical practitioners for minor febrile illnesses, has been the impetus for the majority of research in this area. Studies conducted in the 1980s were descriptive and undertaken predominantly in the United States with some in Canada and Saudi Arabia. During this decade only two controlled intervention studies were reported from the United States. The 1990s saw an

international interest in fever phobia. Descriptive studies from the United Kingdom, Italy, India and Israel and intervention studies from the United States and United Kingdom were published. The quest to understand and enhance parents' management of fever continues into the 21st Century as researchers continue their search to understand parents' fever management concerns and trial new methods of improving parents' management of childhood fever. However, no studies report Australian data.

AIMS AND METHODS

The aim of this paper is to review the literature reporting parents' knowledge, attitudes and practices in the management of childhood fever and the educational interventions implemented to assist parents in their home management of febrile children. Medline, CINAHL, PsycINFO, PsycARTICLES and Web of Science databases were searched from 1980 to 2004. Inclusion criteria were articles written in English exploring fever in common childhood illnesses (excluding, eg., meningitis and malaria) from the developed world and quantitative studies with sample sizes greater than 30. Search terms included: fever, child, parent, education, knowledge, belief, concern, temperature, antipyretic, information and combinations of these terms. This paper discusses the findings under the themes of parents' knowledge, attitudes and practices in fever management, their information sources and the interventions that have been trialled to improve parents' management of childhood fever.

PARENTS' KNOWLEDGE

Temperature

Many people, health professionals included, use body temperature to determine one's state of health (eg., Grossman *et al.* 1995, Blumenthal, 2000, Edwards *et al.* 2001, Sarrell *et al.* 2002). Parents measure temperature by palpation of, or feeling, body

parts and a variety of thermometers. Their knowledge of normal and febrile temperatures is poor. Parents report normal body temperature to range between 35.0°C and 37.2°C (Blumenthal 1998, Singhi *et al.* 1991). In the United Kingdom, many parents expected body temperature to be normal on a hot summer's day (Blumenthal 1998).

Parents define temperatures between 37.0°C and 39.0°C as febrile with 38.0°C the most common (Kelly *et al.* 1996, Blumenthal 1998, Impicciatore *et al.* 1998, Porter & Wenger 2000). Most parents define high fever at temperatures around 39.0°C (Schmitt 1980, Singhi *et al.* 1991, Karwowska *et al.* 2002) although recently some parents reported temperatures between 39.0°C and 40.0°C as high fever (Al-Eissa *et al.* 2000a, Crocetti *et al.* 2001). In the 1980s 48% of parents reported untreated temperatures could rise to between 41.7°C and 43.3°C (Schmitt 1980, Kramer *et al.* 1985).

Predictors of parents' knowledge about temperature

There has been limited exploration of the predictors of parents' knowledge about fever. In the 1980s Kramer (1985) discovered an inverse relationship between the child's age and the minimum temperature considered fever. Parents of younger children considered higher temperatures to indicate fever than did parents of older children. Recently, no differences in knowledge of the temperature for fever were found in a culturally diverse population in the United States between Latinos, African American and white Americans (Taveras *et al.* 2004). However, the height of fever is commonly the deciding factor behind parents presenting at an emergency department (McErlean *et al.* 2001).

Antipyretics

Parents' knowledge about the effectiveness and appropriate dosing of antipyretics is questionable. They possess incorrect knowledge about concentration differences between liquid paracetamol and paracetamol drops (65%) (Barrett & Norton 2000). Some reported paracetamol and aspirin have antihistamine, antiviral and decongestant properties (Ames *et al.* 1982). Parents reported paracetamol improved their child's well-being (46%), prevented febrile convulsions (20%) or prevented febrile convulsions and brain damage (28%) (Sarrell *et al.* 2002). Some parents (6%) were unaware there was an upper daily limit for safe paracetamol administration to children (Linder *et al.* 1999). Although many knew an overdose of paracetamol could be dangerous (62%) (Linder *et al.* 1999) or lethal (53%) (Kapasi *et al.*, 1980) fewer were aware of the possibility of liver toxicity (26%) (Linder *et al.* 1999). Parents (45%) expect antipyretics to reduce temperatures to normal (Linder *et al.* 1999) and for the temperature to remain lowered for longer than the therapeutic time period (Kelly *et al.* 1996). Knowledge about the effectiveness of antipyretics influences parents' decisions to seek medical assistance. The failure of fever to respond to antipyretics is frequently the reason parents attend emergency departments (Kelly *et al.* 1996, McErlean *et al.* 2001, Goldman & Scolnik 2004).

Many parents administer antipyretics in too low, high or frequent doses (Li *et al.* 2000, Goldman & Scolnik 2004) with incorrect dosing more common in younger and low weight children (Gribetz & Cronley 1987, Li *et al.* 2000). Incorrect antipyretic dosing was reported nearly two decades ago. Only 32% to 35% of parents' correctly dosed febrile children with paracetamol; 39% of parents underdosed (Gribetz & Cronley 1987, Kilmon 1987) and 12% overdosed their child (Kilmon 1987). More recently, less than half, between 47% (McErlean *et al.* 2001, Goldman & Scolnik

2004) and 49% (Li *et al.* 2000) of febrile children presenting at emergency departments received appropriate antipyretic doses prior to presentation. Parents administer doses between 6mg/kg/dose (Gribetz & Cronley 1987) to 120mg/kg/day (Linder *et al.*, 1999). Recently, mean paracetamol dose administered by parents was 8.3mg/kg/dose (Goldman & Scolnik 2004). Underdosing results from parents misunderstanding that a three millilitre teaspoon holds five millilitres (Hyam *et al.* 1989, Linder *et al.* 1999), dosages not increasing with weight (Linder *et al.*, 1999), incorrect beliefs about the concentrations of children's paracetamol liquid and drops (Barrett & Norton 2000) and dosing for the child's age or height of the fever (Li *et al.* 2000). Although some improvement has been reported in correct antipyretic dosing over the past two decades overdosing has increased. In 1999, 43% of parents correctly dosed their child, 24% underdosed and 33% overdosed (Linder *et al.* 1999).

Alternating antipyretics is the latest method of controlling fevers. Crocetti *et al.* (2001) found 27% of parents' administered two antipyretics to febrile children. When parents do not perceive the antipyresis from one antipyretic, eg., paracetamol, to be satisfactory then another antipyretic, eg., ibuprofen, is administered one to two hours later. This practice introduces another avenue for incorrect antipyretic usage. Parents incorrectly dosed children with either one or both the antipyretics, paracetamol and ibuprofen (Li *et al.* 2000). Fourteen of 200 children received alternating antipyretics; only one received correct doses of both. Parents were more likely to overdose with ibuprofen than paracetamol both in dosage and frequency. Fever legitimises the use of antipyretics for fever related problems, such as helping the child during illness, alleviating suffering and enabling the child to sleep, providing the child with some comfort and giving parents a feeling of coping (Lagerlov *et al.*, 2003).

Predictors of parents' antipyretic knowledge

Predictors of parents' knowledge about antipyretics and correct dosing were identified in the 1980s. Parents' education, income and age predicted antipyretic knowledge (Ames *et al.* 1982). Less knowledge was associated with lower education levels (7-12 years of formal education), age between 15 and 30 years, lower income levels or identification through the use of subsidised public care. Although, in the late 1990s younger mothers were more likely to read the instructions packaged in the bottle and comply with recommended dosages (Linder *et al.* 1999), these differences have not been found in the 21st century. More recent studies have focused on antipyretic use rather than knowledge per se. Learning about antipyretics from doctors made no difference to parents' antipyretic knowledge. Neither parental, including contacting a medical practitioner about antipyretic dosage, nor child variables have been found to predict accurate antipyretic usage (McErlean *et al.* 2001) or knowledge (Barrett & Norton 2000).

Summary of parents' knowledge

In summary, parents' knowledge about normal body temperature and the temperature that determines fever is poor. They classify mild fever as high and actively reduce temperatures, sometimes normal temperatures, with incorrect doses of antipyretics. When underdosed children's temperatures are not reduced to a level parents consider satisfactory they seek medical assistance placing an additional burdens on strained health systems. No studies report Australian parents' knowledge of fever or their use of antipyretic in fever management.

ATTITUDES

Fever

Parents' fever phobia, their concern about and inappropriate treatment of childhood fever, is well documented and possibly multifactorial (eg., Schmitt 1980, Kramer *et al.* 1985, Knoebel *et al.* 2002). It may be caused by past personal experience with febrile children, anecdotal tragic outcomes of febrile children, cultural influences and information provided by family, health professionals and other sources (Poirier *et al.* 2000). In the 24 years of literature reviewed many parents believed fever to be harmful and were very worried about the perceived harmful effects of fever despite numerous reports of the scientific findings about the benefits of mild to moderate fever in the medical and scientific literature (eg., Kluger 1986, Lorin 1986, Lorin 1999, Zeisberger 1999, Mackowiak 2000, Blatteis 2003, Roth *et al.* 2004).

Parents' perceptions of the temperature when the harmful effects of fever could occur have changed over time. In 1980s, although 94% of American parents of well children (N=100) believed fever harmful, only 4% believed fevers of 37.8°C or lower harmful; 48% believed fevers below 40°C (moderate fever) harmful (Schmitt 1980). In a recent Israeli study (N=1000), 43% believed in the beneficial effects of low grade fever (37°C to 38°C) during infection, 57% believed low grade fevers (38°C or lower) harmful (Sarrell *et al.* 2002).

Although parents' rating of the harmful effects of fever have changed from 1980 to 2004, their main concerns continue to be brain damage, febrile convulsions and death (eg., Schmitt 1980, Kramer, 1985, Abdullah *et al.* 1987, Anderson 1988, Al-Eissa *et al.* 2000a, Crocetti *et al.* 2001, Karwowska *et al.* 2002). In the 1980s, parents were more concerned about brain damage as a result of a fever (38% to 46%) than febrile convulsions (15% to 39%) (Schmitt 1980, Abdullah *et al.* 1987). More recently, although concerns about brain damage remain (21% to 53%), concerns about febrile convulsions have increased dramatically (32% to 70%) (Al-Eissa *et al.* 2000a,

Crocetti *et al.* 2001, Karwowska *et al.* 2002). Parents reports of concerns that fever is a sign of serious illness have reduced from 12% to 43% in the 1980s (Schmitt 1980, Abdullah *et al.* 1987) to 2% to 28% in the 2000s (Al-Eissa *et al.* 2000a, Crocetti *et al.* 2001). However, a considerable increase in concern about dehydration (80%) and discomfort (75%) was reported by Canadian parents recently (Karwowska *et al.* 2002) compared with 4% to 8% in the 1980s (Schmitt, 1980, Anderson, 1988).

Most research exploring parents' attitudes and practices in fever management has been quantitative; some qualitative studies during the past decade have explored parents' perceptions of fever. Kai (1996b) found parents' concerns influenced by the perceived threat of the illness, anxieties about fever, coughs and the possibility of meningitis. These anxieties were heightened by their knowledge that non-specific symptoms could precede a rapidly progressing serious illness. The degree of parental concern about a symptom of an illness, eg., a fever or cough, is dependent upon their perception of the symptom hurting their child. Parents' personal control is threatened by their child's illness and attempts to maintain control include monitoring symptoms and minimising discomfort. Lagerlov, Helseth and Holager (2003) reported that although parents acknowledged low to moderate fever to reflect the body's immunological response they considered high or rapidly rising fever to be dangerous.

Predictors of parents' attitudes toward fever

Predictors for parents' concerns about fever have been identified. Italian mothers' concerns were positively associated with lack of information about fever management, moderate fever in their child, inexperience with managing febrile children and low maternal educational levels (Impicciatore *et al.* 1998). Other studies corroborate these predictors, even among highly educated and higher socioeconomic

classes (Kramer *et al.* 1985, Singhi *et al.* 1991). There has been little change in this during the last two decades (Crocetti *et al.* 2001).

Summary of parents' attitudes

In summary, although there is a move toward acknowledging the benefits of mild fever, attitudes toward fever remain negative. Beliefs about harmful outcomes from fever, brain damage, febrile convulsions and death, identified in 1980 persist irrespective of parental education or socio-economic status. Concerns about febrile convulsions, dehydration and discomfort associated with fever have increased. Attitudes toward fever seem to be similar irrespective of country of origin.

PRACTICES

Temperature Taking

Although parents are concerned about the height of their child's temperature, not all have a thermometer at home (38% to 44%) (Fischer *et al.* 1985). Owning a thermometer does not predict ability to accurately take or read temperatures. Few parents (30% to 46%) could accurately take and read a temperature (Fischer *et al.* 1985, Porter & Wenger 2000, Taveras *et al.* 2004). Despite this, parents take febrile children's temperatures regularly, often hourly (Crocetti *et al.* 2001) and initiate activities to reduce temperatures; sometimes temperatures within a normal range (Schmitt 1980, Kilmon 1987, Blumenthal 1998, Crocetti *et al.* 2001, Sarrell *et al.* 2002).

Correlations between inability to accurately take a temperature and parent variables have been examined. Lower socioeconomic status and not owning a thermometer predict an inability to accurately read a thermometer (Fischer *et al.* 1985). Fischer *et al.* found no relationship between maternal age and the presence of other children in

the home with the ability to read a thermometer. Banco and Jayasher-karamurthy (1990) discovered younger parents and parents with higher socioeconomic backgrounds and higher educational levels were more likely to own and be accurately read a mercury thermometer. This was corroborated in 2000 by Porter and Wegner (2000); maternal age, educational level and socioeconomic status predicted accuracy of temperature talking.

Fever Management

Antipyretics have been and remain the preferred method for reducing fevers for many parents (eg. Kramer *et al.* 1985, Anderson 1988, Kelly *et al.* 1996, Impicciatore *et al.* 1998, Linder *et al.* 1999, McErlean *et al.* 2001)). Parents prefer to treat fever with antipyretics rather than reducing additional clothing or tepid sponging (Kinmonth *et al.* 1992). Antipyretic use in fever management has increased from 67% of parents in 1980 (Schmitt 1980) to 95% in 2002 (Karwowska *et al.* 2002). Antipyretics were administered to children with temperatures in a normal range in 1980s (67%) (Schmitt 1980) and temperatures below 38.3°C (71%) (Casey *et al.* 1984). This has reduced in the 2000s with only 23% of parents treating fevers below 37.8°C with antipyretics (Crocetti *et al.* 2001). However, parents today (46%) use antipyretics to promote their child's wellbeing during a febrile episode (Sarrell *et al.* 2002). The use of antipyretics gives parents a feeling of mastery when their child is ill (Lagerlov *et al.* 2003) and, in Australia, paracetamol is most commonly used for fever and teething (Allotey *et al.* 2004).

Parents' practices qualify their concerns. Waking sleeping febrile children for an antipyretic was one of the early factors describing fever phobia (Schmitt 1980); this practice that has not changed. In 1980 48% to 53% of parents woke sleeping febrile children (Schmitt 1980, Kramer *et al.* 1985). Today, this has increased to between

66% and 92% (Al-Eissa *et al.* 2000b, Crocetti *et al.* 2001, Sarrell *et al.* 2002). Parents need reassurance that they are managing their febrile child appropriately. They often contact medical practitioners for low fevers or fevers of short duration (Kramer *et al.* 1985, Kelly *et al.* 1996, Singhi *et al.* 1991, Impicciatore *et al.* 1998). Although this creates guilt in some parents, they feel they have little choice; their concern for their child needed a shared responsibility (Kai 1996b).

Other fever management practices in the 1980s included tepid, cold or ice-cold water sponging or baths, and alcohol rubs (Schmitt 1980, Kramer *et al.* 1985, Abdullah *et al.* 1987, Anderson 1988). Although tepid sponging continues to be popular in the early 2000s (Al-Eissa *et al.* 2000b, Crocetti *et al.* 2001, Karwowska *et al.* 2002) cold or ice-cold water sponging or baths and alcohol rubs tend to be used less frequently (Karwowska *et al.* 2002). In Saudi Arabia, some parents continue to keep their child warm by controlling ambient air temperature or additional clothing (Abdullah *et al.* 1987, Al-Eissa *et al.* 2000b). Parents combine treatments such as tepid sponging and antipyretic administration (Kramer *et al.* 1985, Blumenthal 1998, Al-Eissa *et al.* 2000a). One fever management practice that has changed since the association between Reye Syndrome, aspirin and influenza is the use of aspirin as an antipyretic; this has almost disappeared along with a decline in Reye Syndrome (Drwal-Klein & Phelps 1992, Cranswick 2000).

Summary of practices

Although parents do not take accurate temperatures, they continue to base their fever management practices on the temperature reading. However, fewer parents today aim to reduce temperatures in normal ranges. Some practices have reduced over time, such as the use aspirin and cold or iced water to reduce fever. Others reflect an increased concern about harmful effects of fever and the need for control during this frightening

time, the increased use of antipyretic to reduce fever and waking sleeping febrile children for antipyretics or sponging. Again studies reporting Australian data have not been published.

Limitations

The data reported above describe parents' knowledge, attitudes and practices in fever management. However, although similar findings have been found in a number of different countries and cultures most studies collected data from concerned parents seeking medical assistance for a health concern such as fever or injury. Therefore, the findings might not be generalisable. No longitudinal studies have been reported. Parents' knowledge, attitudes and practices could change over time, as their child ages and with the birth of subsequent children. Additionally no data report Australian parents' knowledge, attitudes or fever management practices.

Most studies in the 1980s exploring parents' management of fever were descriptive cross-sectional studies using small single-sited convenience samples from hospitals or health clinics (36 to 249) (eg., Schmitt 1980, Ames *et al.* 1982, Kramer *et al.* 1985, Abdullah *et al.* 1987). Instruments were researcher developed (eg., Schmitt 1980, Casey *et al.* 1984, Kramer *et al.* 1985), sometimes items were reported (eg., Schmitt 1980, Kramer *et al.* 1985) and only one study compared findings with earlier studies by using previously developed items (Anderson 1988). However, neither instrument reliability, validity nor data analysis were generally reported (eg., Schmitt 1980, Kramer *et al.* 1985, Abdullah *et al.* 1987).

Larger samples were explored from 1990 onwards (100 to 1,237). Multi-sited studies were reported more frequently than single-sited studies. Again descriptive, cross-sectional, comparative and multi-sited studies compared the perceptions of convenient samples of parents with febrile and afebrile children (eg., Banco &

Jayasherkaramurthy 1990, Linder *et al.* 1999, Impicciatore *et al.* 1998). Community based studies were reported more frequently, three from 1990 to 2004 (Kai 1996b, Linder *et al.* 1999, Impicciatore *et al.* 1998) compared with one in the 1980s (Anderson 1988). Instrument reliability and data analysis were reported more frequently in the 1990s (eg., Kai 1996b, Kelly *et al.* 1996, Impicciatore *et al.* 1998) and in most studies from 2000 onwards.

INFORMATION SOURCES

Fever

Parents learn to manage fever from different sources. In India parents were more likely to learn from parents and relatives than doctors, reading or friends. However, educated parents from higher socioeconomic backgrounds were more likely to learn from reading and doctors (Singhi *et al.* 1991). Saudi Arabian parents were equally likely to learn fever management from relatives and friends, reading and doctors (Al-Eissa *et al.* 2000b). Italian mothers generally learn fever management from medical practitioners during a febrile episode than a visit when the child was not ill (Impicciatore *et al.* 1998). More parents in the United States learn from doctors and nurses than friends and relatives, experience, reading or television (Crocetti *et al.* 2001). Canadian parents are most likely to learn fever management from doctors (Karwowska *et al.* 2002), other regular sources are their family, nurses, books, magazines and some from the Internet and television.

Antipyretics

In the United States in the 1980s parents learnt antipyretic dosing from doctors, previous experience, friends, product advertising and medical reference books (Ames *et al.* 1982 1843). In the 21st century parents are more likely to gather medication

information from medical practitioners and the package labelling (Li *et al.* 2000). However, the source of antipyretic information did not make any significant difference between correct and incorrect doses in the United States (Li *et al.* 2000). Israeli parents learn from doctors, mothers/grandmothers and instructions on the bottle (Linder *et al.* 1999). It is unknown how Australian parents learn to manage fever. With the cultural variability in information sources this needs addressing.

EDUCATIONAL INTERVENTIONS IN FEVER MANAGEMENT

Controlled educational interventions have effectively enhanced parents' knowledge and fever management practices, reduced their fever related anxiety and fever related visits and telephone calls to medical practitioners. During the 1980s experimental studies were undertaken in health clinics to reduce inappropriate visits by educating parents about fever management (Casey *et al.* 1984, Robinson *et al.* 1989). These studies effectively increased parents' knowledge and reduced antipyretic use in temperatures below 38.3°C, dosing errors and parents' physician visits and telephone calls in parents from middle socioeconomic backgrounds (Casey *et al.* 1984, Robinson *et al.* 1989). These positive changes were still evident six months after the intervention.

A randomised controlled community based study in the United Kingdom determined the effectiveness of an educational booklet explaining the symptoms and management of childhood illnesses, such as fever, cough, sore throat and diarrhoea on general practice clinic visits did not reduce clinic visits for fever (Usherwood 1991). However, home visits and out of hours calls for febrile children were significantly reduced. A paediatrician administered intervention about the benefits of fever and appropriate fever management practice was successful in Israel (Sarrell & Kahan 2003). Parents' definition of the different levels of fever (low, moderate and high),

knowledge of when to initiate non-pharmacological rather than pharmacological fever management reduction strategies and the rate of visits to paediatricians and emergency departments for febrile concerns were corrected.

Nursing interventions have been implemented. A comparative, pre-post-test study explored the effectiveness of educational interventions among minority groups with lower socioeconomic backgrounds using an instruction sheet focused on aspects of fever and its management (Kelly *et al.* 1996). Although unsuccessful in altering knowledge of the temperature when an antipyretic should be administered the intervention did improve accuracy of medication dosing. Quasi-experimental interventions in emergency departments successfully reduced parental anxiety, improved caretakers' home management of fever and reduced emergency department visits for fever (Murphy & Liebman 1995, O'Neill-Murphy *et al.* 2001).

Murphy and Liebman (1995) explored the efficacy of different teaching methods in reducing parental anxiety, increasing ability to read a thermometer and manage fever at home. Demonstration, discussion and written educational methods were equally effective. O'Neill-Murphy *et al.* (2001) found a standard written fever pamphlet and an interactive educational intervention equally effective. A recent American study undertaken by Broome *et al.* (2003) attempted a theoretically based intervention. Based on the attitudinal construct of the Theory of Planned Behavior (Ajzen 1985) the study explored the concept that knowledge and attitudes influence decision making. They purported that increasing parents' knowledge about assessing childhood fevers, communicating with health professionals and implementing prescribed fever management therapies would change their attitudes toward and knowledge about fever management. Experimental groups had significantly more knowledge, and an

increase, though not significant, in confidence in fever management. However, changes in attitudes were not reported.

Summary

Educational interventions have successfully reduced parents' unnecessary use of health services for fever. Additionally, they improved knowledge about fever, when to implement management strategies and the accuracy of their antipyretic dosing through various mediums. Different educational mediums, eg., discussion with a health professional, videos, pamphlets and booklets and a combination of these did not influence outcomes. Only one intervention was theoretically based and addressed attitudes, all others targeted knowledge to change fever management behaviours. There is a need for theoretically based interventions to not only target knowledge, but also attitudes, intentions and practices in fever management.

Limitations

Many of the intervention studies target knowledge only and used potentially biased convenience samples of parents concerned about fever, those attending paediatricians (Sarrell & Kahan 2003) and emergency departments (eg., Murphy & Liebman 1995, O'Neill-Murphy *et al.* 2001) for fever related concerns. Some studies reduced inappropriate health professional contact for childhood fevers and increased parents' knowledge (eg., Casey *et al.* 1984, Robinson *et al.* 1989, Broome *et al.* 2003) although not all did (Kelly *et al.* 1996). Samples in comparative studies were small (52 to 156) (Kinmonth *et al.* 1992, Kelly *et al.* 1996). Quasi-experimental studies had similarly sized samples (87 to 130) (Casey *et al.* 1984, Murphy & Liebman 1995, O'Neill-Murphy *et al.* 2001, Sarrell & Kahan 2003) and samples in randomised controlled trials ranged from 216 to 497 (Robinson *et al.* 1989, Usherwood 1991, Broome *et al.* 2003).

DISCUSSION

There have been few changes in parents' knowledge, attitudes and practices over the past two decades. Definitions of high fever are moving in the right direction; however they are still low at 40°C, moderate fever (Sarrell *et al.* 2002). Parents continue to treat low grade fevers. The literature recommends treating temperatures of 40°C or higher as there are immunological benefits in temperatures below 40°C (Lorin 1994, 1999, Connell 1997). The height of fever has been and remains a common deciding factor in decision making related to seeking medical assistance. When this is associated with underdosing of antipyretics and expectations of temperatures to remain lowered longer than the therapeutic period it is no wonder medical services are being overused for febrile children. Concern in the literature about antipyretic overdosing is apt, particularly with the introduction of alternating antipyretics. The incidence of overdosing has nearly trebled from the 1980s to the 2000s. An important finding for health professionals is the lack of association between appropriate antipyretic use and learning about antipyretics from health professionals. This necessitates further exploration.

Parents' fever phobia or unrealistic concerns about fever persist. The decline in concerns about brain damage might reflect reduced phobias. Increased concerns about febrile convulsions and meningitis could be the result of extensive media coverage of rare, serious childhood illnesses, such as meningococcal meningitis, increasing parental concerns. The reason for increased concerns about febrile convulsions needs exploring. Less than 5% of children younger under five years have a febrile convulsion (D'Auria 1997). Febrile convulsions are benign (Baumann 2001), have a genetic component (Freeman 1992, Johnson *et al.* 1998, Kluger & Johnson 1998,

Sadovsky 2002) and antipyretics do not prevent them (Dawson & Capaldi 1994, Purssell 2000, Woollard and Pitt 2003).

Educational interventions to improve parents' knowledge and practices are reportedly successful. Why then have there been no significant changes in parents' knowledge, attitudes and practices over the past two decades. Many educational programs were developed for a specific reason, to reduce parents' use of medical services for self limiting viral infections. Educational booklets have been developed (eg., Krantz 2001) but there is no reported evaluation of their effectiveness. Interventions targeted knowledge to change fever management behaviours, not attitudes or environmental factors such as social influences and parents control when their child has a fever. Descriptive studies were often just that, not a precursor in the development of an educational intervention to target the particular parents' specific needs. There is a need to identify the knowledge, attitudes and practices of parents, and then develop, for these parents, an educational intervention based on a behaviour change theory that has been proven effective in situations where people are emotionally involved in the behaviour.

The constancy of knowledge, attitudes and practices in countries where new parents learn to manage fever from their parents is understandable. However, this is not acceptable in countries where parents learn to manage fever from health professionals. An exploration of the literature about health professionals' knowledge, attitudes and practices in this area sheds some light. Doctors' and nurses' concerns about the harmful effects of fever have been identified since the 1980s (Abdullah *et al.* 1987, Thomas *et al.* 1994) and they have been described as fever phobic (Poirier *et al.* 2001) (Sarrell *et al.* 2002). Paediatricians contribute to fever phobia (May & Bauchner 1992). Health professionals concern about fever could explain the few differences in

fever related concerns between parents who learn to manage fever from health professionals compared with those learning fever management practices from previous generations. Concerns about the quality of information on the Internet influencing parents' fever management (Haddow & Watts 2003) was not demonstrated but could be increasing and needs to be explored. Many similarities have been identified between parents from different countries and cultures. However, there is no data reporting Australian parents' knowledge, attitudes or practices. Australia has a multicultural population and there is a need to explore fever management practices in Australia.

CONCLUSIONS AND RECOMMENDATIONS

Caring for a febrile child remains an emotionally challenging period for parents. Limited improvements in knowledge, attitudes and practices highlight the need for further structured research programs in this area. Parents' knowledge, attitudes and practices must become evidence-based. To facilitate this, an assessment of parents' knowledge, attitudes, practices and identified educational needs must precede the development of theoretically based educational interventions. The dearth of Australian research in this area of children's health is an area that requires addressing.

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